An Alternative Approach to Type 2 Diabetes Care: The Inclusion of Community Health Worker Interventions in Patient Care

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Dedication

For Miles, my partner and closest friend:

"I carry your heart with me (I carry it in my heart)

I am never without it (anywhere I go you go, my dear;

and whatever is done by only me is your doing, my darling)" (E. E. Cummings)

Abstract

A wealth of research has been conducted on the successful management of Type 2 diabetes. Yet for many patients and their families, this disease remains a considerable challenge and current care practices are insufficient. Previous research has highlighted how problematic this gap is with respect to patient- and community-health. Recently, scholarship and clinical practice have shifted attention to exploring alternative approaches to care. The use of community health workers (CHW) to bridge the gap between patients and the medical system has gained attention and support from preliminary research and practice. The present research aims to extend what is known about the association between CHW interventions and patients' biopsychosocial health outcomes via a two-pronged approach. First, I conducted a systematic review of randomized controlled trials of CHW-delivered interventions to orient researchers and clinicians to the current state of this work and to present a call to action for where future research needs to go. This study identified the lack of consistency in the theoretical conceptualization, design, and delivery of CHW interventions. Specifically, there was great variation across studies' intervention dosages, attrition rates, and methods of CHW training. The main foci across studies' findings demonstrated a relationship between a CHW-delivered intervention and improvements in patients' physical and emotional health, diabetes knowledge, and self-care behaviors.

Second, I conducted a pilot study following a mixed-method design testing a one-year CHW-delivered intervention. A sequential, explanatory mixed-method approach was used to gain breadth and depth of understanding, and to corroborate findings. More specifically, quantitative data collection and analyses preceded the qualitative interviews

and thematic analysis, which included a sample of the intervention group. Quantitative data were gathered at baseline, 6-months, and 12-months to assess patients' physical health, emotional well-being, and perceived social support. Health outcomes data were compared with a matched control group. Phenomenological qualitative data were gathered via key informant interviews and analyzed using Crabtree and Miller's (1999) thematic analysis method. Findings from statistical analyses based on standardized measures revealed a significant improvement in perceived social support from baseline to 6-months, and a significant improvement in dietary adherence from baseline to 12-months. Findings from phenomenological interviews showed a significant improvement in perceived social support from a special person and in dietary adherence. Thematic analysis revealed a major theme regarding CHW roles (i.e., coach, advocate, teacher, and confidant). A second major theme outlined ecological impacts (i.e., support that participants received from family members was primarily tangible in-nature, and diabetes management – for participants – represents only a part of a considerably larger and more complex picture of health and well-being).

Implications of these two studies point to the need for comprehensive care that includes the CHW as a member of care teams. With the growing need to provide more comprehensive health care, future research is warranted to continue to tease out the primary mechanisms of change within CHW interventions. This information is important to further refine the hiring process of CHWs best equipped for the role, CHW training, and the foci of CHW attention in their work with patients. These efforts will also further-equip providers to support patients' Type 2 diabetes management, advancing the Triple Aim of healthcare.

Table of Contents

List of Tables

"a" refers to tables in Article 1
"b" refers to tables in Article 2

List of Figures

"i" refers to figures in the Introduction
"a" refers to figures in Article 1
"b" refers to figures in Article 2

Introduction

The United States healthcare system has become the most costly in the world, accounting for 17% of the country's gross domestic product with estimates that this percentage will grow to nearly 20% by 2020 (Institute for Healthcare Improvement [IHI], 2017). Aging populations and increased longevity, coupled with chronic health problems, have become a global challenge, putting new demands on medical and social services. The Triple Aim of Health Care, developed by the IHI, describes an approach to optimizing the provision of health care and health system performance (IHI, 2017). The three-pronged approach simultaneously focuses on (a) improving patients' experiences of care, (b) improving the health of the population, and (c) reducing the per capita cost of services. No one party or system is responsible for managing all three prongs; a systemic approach to change – including individuals, families, communities, healthcare providers, health systems, insurance providers, and so on – is required. While a multitude of efforts have been made over the past decade to address the Triple Aim (e.g., identifying target populations, developing innovative financing approaches), research shows that the prevalence of chronic disease, particularly Type 2 diabetes (T2D), has continued to increase rapidly (Centers for Disease Control and Prevention [CDC], 2016; World Health Organization, 2016).

Patients diagnosed with T2D carry both the burden of disease (e.g., pain, disability, loss of independence) and the burden of treatment (e.g., frequent appointments, medications and their side effects, referrals to specialists). For medically underserved populations (e.g., high poverty, Medicaid-eligible; Health Resources & Services Administration, 2016) in particular, this workload often overwhelms patients' capacities

(Bohlen, Scoville, Shippee, May, & Montori, 2012; Shippee, Shah, May, Mair, & Montori, 2012), leading to poor disease management and an increased risk of complications and mortality (Mayo Clinic, 2014). This creates a gap between patients' ability and the standard approach(es) to care of the larger medical system. As such, a more efficient and targeted approach to health care management of the United States' leading chronic diseases, such as T2D, is needed.

Community health workers (CHWs) represent public health professionals who are uniquely positioned to bridge the gap between the patient/community and the medical health system. These individuals serve as a trusted partner to patients and act as a liaison to facilitate access to services and improve the quality and delivery of care (American Public Health Association [APHA], 2017). Common roles of CHWs include conducting outreach and community education, providing advocacy and resources (e.g., medical resources, daily living resources), increasing patients' health knowledge and self-sufficiency, and providing informal counseling and social support, (APHA, 2017; Minnesota Community Health Worker Alliance, 2013). Utilization of CHWs in T2D care has gained momentum as an alternative, more holistic approach to care (Albright et al., 2009; Shah, Kaselitz, & Heisler, 2013).

Significance

Over the past 50 years, the literature has documented the development and diversification of CHWs' roles (Lehmann & Sanders, 2007; Toban, 1970). Researchers have investigated the effectiveness of CHWs across several different diseases (e.g., T2D, HIV/AIDS, hypertension; Fedder, Chang, Curry, & Nichols, 2003; Schneider, Hlophe, & van Rensburg, 2008) and populations (e.g., Latinos, African Americans; Gary et al.,

2003; Spencer et al., 2013). Valuable information has been gleaned from this work that has informed current practices. However, within the literature to-date, it remains unclear what guiding framework(s) is/are most effective for CHW-delivered interventions. Further, the linkages between CHW roles and tasks and improved health outcomes remains unclear. As a result, a systematic review of the literature is warranted to synthesize what has been tested and to identify existing gaps in current knowledge (see Article 1). Guided by this review, research is needed to further clarify links between the CHW intervention and health outcomes. Maintaining focus on the Triple Aim of Health Care, a mixed methodology design would best demonstrate intervention impact (see Article 2) because it has the potential to address healthcare costs and health outcomes (quantitative data) alongside patients' lived experiences of care (qualitative data).

Theoretical Conceptualization

The biopsychosocial model of health and illness and the double ABC-X model of family stress provide meaningful lenses to guide this research. The biopsychosocial model, first advanced by Engel (1977), offers an integrated approach to understanding health and illness. This model expands the conventional biomedical model of health, which is a comparatively narrow perspective that focuses on biochemical explanations of illness, to include considerations of the psychological and social factors that also influence the development and outcome(s) of a disease. Specifically, this model posits that our biological, psychological, and social health are interwoven; they cannot be separated. For example, the majority of Type 2 diabetes self-care behaviors take place in the home environment (Miller & DiMatteo, 2013); to fully understand a patient's physical health and adherence to exercise and diet regimens, one must also consider how

psychological factors (e.g., depression or anxiety symptoms) and social/relational factors (e.g., family assistance, financial strains associated with healthy food and/or medication purchases) that support or impede adherence. Furthermore, a change in one component of health has ripple effects and produces change in the others. For example, if the patient discussed in the example above begins to receive additional support and encouragement from family members in making healthy meals and exercising daily, it can be expected that this will have an effect on his/her well-being across both psychological health and physical health. This theoretical model is appropriate to guide this research by nature of its sensitivity to the interplay between biological, psychological, and social/relational factors.

The double ABC-X model of family stress is an extension from the original ABC-X model developed by Hill (1949; see Figure i). The original model proposed that an individual, couple, or family's ability to adapt to a situation is dependent on the stressors and resources present, alongside his/her/their perception of the two. McCubbin and Patterson (1983) broadened this model by considering changes in stressors, resources, and perceptions post-crisis, as opposed to focusing solely on factors leading up to the crisis. The double ABC-X model suggests that individual, couple, and familial outcomes following the impact of a stressor or crisis are the by-product of the interaction(s) between the change in demands or stressors, the expansion or adaptation of resources, and one's perception of his or her new demands and resources. For example, the negative effects of one's demands (e.g., increased stress from adopting new diet and exercise regimens) piling up may be mediated by additional personal, familial, and community resources (e.g., increased knowledge, family or peer social support, working with a

CHW) and by a shift in perspective from viewing diabetes as being overwhelming to being manageable. These changes post-crisis may lead to positive coping and adaptation over time.

The intervention tested in Article 2 examines the effect of expanding a patient's resources to include a CHW, alongside the patient's perceptions – collected via quantitative and qualitative assessments – about his/her individual outcomes (e.g., depression symptoms, anxiety symptoms, and dietary and exercise adherence) and social support networks (e.g., those involving partner, family members, and/or peers). This theoretical model is appropriate to guide this research by nature of its primary foci on stressors (e.g., daily self-care behaviors), resources (e.g., social support), perceptions (e.g., patients' experiences of managing Type 2 diabetes with respect to social support), and its recognition of the potential for change in these phenomena over time.

Guiding Research Questions

The current state of knowledge and existing gaps in the literature discussed above have informed the development of the following primary research questions:

(1) What have randomized controlled trials reported regarding the effectiveness of CHW-delivered interventions for patients with T2D? (Article 1)

(2) Are there significant differences post-intervention between the CHW intervention group and the matched control group in LDL and BMI levels? (Article 2)

(3) How was patients' experience of working with the community health worker associated with changes in their ability to manage diabetes self-care regimens (i.e., diet, exercise), emotional distress (i.e., depression symptoms, anxiety

symptoms), and perceived social support (i.e., from a special person, family members, and peers)? (Article 2)

Collectively, these two studies will orient researchers and practitioners to the current state of the literature on CHW-delivered interventions for T2D. These studies will also advance our understanding of the mechanisms of change within CHW-delivered interventions and its associations with changes in patients' health outcomes.

Article 1

Community Health Workers in Diabetes Care: A Systematic Review of Randomized Controlled Trials

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Dissertation Article 1

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Synopsis

***Introduction*:** Maintaining optimal self-care in managing Type 2 diabetes is a common struggle for patients due to several barriers, including access to quality services, financial insecurity and/or lack of insurance, and emotional distress. Consequently, morbidity and mortality rates are high, alongside rising healthcare costs. Alternative approaches that address common barriers require further investigation. This systematic review of randomized controlled trials examines the effectiveness of using community health workers (CHWs) in Type 2 diabetes care. This effort is warranted to orient practitioners and researchers to the state of existing knowledge, and to direct clinical practice and future study.

***Method*:** Searching across five major databases, data were extracted from 17 peer-reviewed articles; they were examined with respect to theory integration, CHW intervention design, outcome variables, and findings.

***Results*:** Approximately one third of the articles explicitly integrated theory into their research conceptualization and design. There was great variation across intervention dosages, attrition rates, and methods of CHW training. Main foci across studies' findings suggest that a CHW intervention has significant impacts on physical health outcomes, diabetes knowledge, self-care behaviors, and emotional distress and well-being.

***Discussion*:** Principal implications relate to the need for more research regarding CHW intervention types and methods, and further investigation about the mechanisms of change within a CHW-delivered intervention. Findings support the case for including CHWs in treatment teams to bridge patients with the medical system. This research will serve to better equip providers in the support of patients managing Type 2 diabetes and advance the Triple Aim of healthcare.

Keywords: *Chronic Illness; Community Health Workers; Diabetes; Type 2 Diabetes*

Consideration of non-traditional approaches in Type 2 diabetes (T2D) care is needed as patients continue to struggle with the intense and often complex responsibilities of managing this chronic illness. Many patients fail to achieve optimal outcomes (e.g., metabolic control, healthy weight, good dietary and exercise practices; Ali et al., 2013), which places them at increased risk for serious and potentially fatal disease-related complications. A major barrier to effective disease management is access to care (Carolan-Olah, Cassar, Quiazon, & Lynch, 2013; Chowdhury, Horsley, Zhang, & Satterfield, 2006). This is exacerbated by the fact that many patients also have mental health concerns and/or lack insurance coverage or adequate finances to cover out-of-pocket costs (National Institute of Mental Health [NIH], 2011; Santos-Longhurst, 2014; Zgibor & Songer, 2001).

Involving community health workers (CHWs) in patient care is a rapidly developing and innovative approach for extending the reach of the healthcare system (Perry, Zulliger, & Rogers, 2014). The U.S. Department of Labor (2015) outlined the role of CHWs as encompassing the conduct of outreach to promote individual- and community- health through the provision of resources, social support, informal counseling, and advocacy. CHWs bridge together patients/communities and medical providers/healthcare systems in an effort to reduce barriers that can interfere with the achievement of desired health outcomes.

The purpose of this review was to examine the effectiveness of CHW interventions for patients with T2D. Several other reviews that have included CHWs have been conducted (e.g., Chowdhury et al., 2016; Little, Wang, & Castro, 2014), but these have included multiple professional types (e.g., “lay health worker”, “peer counselors”)

and/or team-based interventions (e.g., nurse care manager + CHW team; pharmacist + CHW team). This review focuses specifically on CHWs evaluated within randomized controlled trials (RCTs). Such designs are well suited to test intervention effectiveness, as they require an unbiased comparison of treatment groups (Navaneethan, Palmer, Smith, Johnson, & Strippoli, 2010; Rosen, Manor, Engelhard, & Zucker, 2006). Anticipated outcomes of this review include efforts toward a more comprehensive approach to healthcare and future research that investigates types and methods of – and mechanisms for change within – CHW interventions that target diabetes.

Method

Studies included in this review tested an intervention using CHWs in the care of adults with T2D. Inclusion criteria were: participants diagnosed with T2D, CHW-delivered intervention, intervention results presented, RCT design, and English language. CHWs were either the sole focus of the intervention under study (e.g., comparing the effectiveness of a CHW versus a control group) or one component of a multicomponent intervention (e.g., comparing the effectiveness of a peer leader versus a CHW). Exclusion criteria were: non-CHW personnel (e.g., "peer supporters" or "lay educators" with different training backgrounds), team-based interventions, and unavailable full texts. To isolate the effects of the CHW, those delivered by teams of providers (e.g., CHW + Nurse Case Manager) were also excluded.

Search Strategy

Using Medical Subjects Headings and text words, including *Diabetes Mellitus, Type 2; Non insulin dependent diabetes mellitus; Community Health Workers; "Community health worker*"; Community health work*; Community Health Services;*

and *Health auxiliary*, the following electronic databases were searched for peer-reviewed articles from the dates first indicated until August 2016: CINAHL (1937), EMBASE (1947), Google Scholar (date range not reported), MEDLINE (1946), and PubMed (1946). A total of 17 articles were identified that met aforementioned inclusion criteria (see Figure 1a).

[Insert Figure 1a here]

Results

For each study included in this review, the author examined sample characteristics, inclusion of theory, CHW training, intervention design, outcome variables, and study results. S

Sample Characteristics

Studies in this review were published between 1997 and 2016. The majority of them were conducted in the United States, with the exception of McDermott et al.'s (2015) investigation in Australia. Sample sizes ranged from 107 to 360 participants (mean = 173). Study samples were most commonly made up of middle-aged female patients (mean of sample means = 53.8 years old) with less than a high school education and low annual household income. Several studies reported targeting populations in rural communities or minority populations (e.g., Babamoto et al., 2009; McDermott et al., 2015; Prezio et al., 2012; Rothschild et al., 2014). Interventions were conducted in primary care clinics, participants' homes, grocery stores, an outpatient department of a clinical research center, and via telephone. Studies varied in the degree to which they described characteristics of the CHWs and/or their prior training and experience. For example, Batts et al. (2001) did not report any descriptions, whereas Corkery et al. (1997)

provided significant detail about the CHW's heritage, location at the time of the study, past volunteer experience, and concomitant skills (e.g., translator).

Theory Integration

Six of the articles included in this review explicitly identified a guiding theory, model, or framework (see Table 1a). Discussion of researchers' use of theory is pertinent to fully understanding their investigative processes, from early conceptualizations of research design to interpreting findings (Kelly, 2010). Further, explicit identification of the theory(ies) helps to avoid alternate interpretations of findings that do not align with authors' intentions.

It is noteworthy that several studies grounded their research in the stages-of-change model by Prochaska and Velicer (1997). This transtheoretical model assesses participants' readiness to adapt new (healthier) behaviors and outlines principles and processes of change at each stage to lower resistance, assist progress, and prevent or respond to relapse (Prochaska, Redding, & Evers, 2002). A diagnosis of T2D often demands immediate and significant behavior changes and then, later, continuous monitoring and adaptation of said changes.

[Insert Table 1a here]

Community Health Worker Intervention

To evaluate and compare CHW interventions across studies, CHW training, intervention topics, intervention dose (intensity and duration), attrition (total and within the CHW intervention group), and participant recruitment strategies were analyzed (see Table 2a). Commonalities found across studies include intervention foci and recruitment strategies. Limitations and/or areas of discrepancy included a lack of reported experience

and evaluation within CHW training, considerable variation in intervention dose, and high attrition rates.

Intervention focus. There was a great deal of overlap across studies with respect to the focus of the CHW interventions. These foci can be classified into four types of service: The first type involved patient education. For example, Perez and colleagues (2015) trained CHWs on T2D pathophysiology, risk factors, and lifestyle strategies for glycemic control (nutrition, physical activity, blood glucose monitoring, medications, etc.). The second type involved patient care and health management (e.g., Heisler et al., 2014; Palmas et al., 2014). This type of service included developing self-management skills, creating goals and action plans, identifying potential barriers, and problem solving. The third type of service involved care coordination (e.g., McDermott et al., 2015; Spencer et al., 2011). In this role, CHWs reinforced instructions from participants' primary care providers, facilitated appointment- and referral- scheduling, etc. The fourth type of service involved providing support regarding patients' mental, emotional, and social health and well-being (e.g., Rothschild et al., 2014; Tang et al., 2014). For example, CHWs evaluated by Rothschild and colleagues (2014) provided social support that targeted stress management.

Recruitment strategy. The primary recruitment strategy used in eight of the 17 studies was a medical chart review. The second most common approach, and frequently used to supplement efforts done via medical chart review, was recruitment during routine medical visits (e.g., Palmas et al., 2014; Wagner et al., 2015). Rothschild et al. (2014) recruited via direct mailings, outreach efforts, and through partnerships with primary care clinics. Four studies did not report their recruitment strategy.

CHW training. The majority of studies reported the training and education provided for their respective CHWs; however, few reported receiving any formal evaluation of their delivery of the intervention during their training. This information is critical to evaluating the quality of CHW interventions. Several researchers (e.g., Tang et al., 2014) reported using CHWs who had previously received rigorous training and had several years of prior experience prior experience, whereas other researchers (e.g., Corkery et al., 1996) reported little to no information regarding CHW training or prior experience.

[Insert Table 2a here]

Intervention dose. The documented dose intensity (i.e., how many total contacts participants had CHWs) ranged from three to 36 contacts, not including additional phone calls (made on an as-needed basis). The documented dose duration (i.e., how long participants met with CHWs) ranged from 8-10 weeks to 24 months, with two studies that had varied durations (Corkery et al., 1996; Wagner et al., 2015). The average length of time per meeting was not routinely reported. The majority of studies did not report a set intervention frequency (i.e., how often CHWs had contact with participants). The most common frequency noted was approximately one contact per month, but this did not account for additional phone calls. This variation in intervention dose across studies makes it difficult to compare study outcomes. An additional challenge presents itself in comparing dose intensity and duration across studies: secondary to differences in reporting, some studies reported the mean dose (e.g., Prezio et al., 2013) whereas others only reported goals set for the desired dose (e.g., Tang et al., 2014).

Attrition. Reporting attrition in RCTs is critical, as loss to follow-up can diminish the strength of a trial's findings (Dumville, Torgerson, & Hewitt, 2006). Further, high attrition can introduce bias if the characteristics of participants who left the study differ from those who stayed in the intervention and control groups (Fewtrell et al., 2008). Therefore, it is important to report the attrition rate for both the total sample and the respective intervention group(s). Of the 17 studies reviewed, nine reported both the total and intervention attrition rates. Five reported either the total or the intervention attrition rate, but not both. Three failed to report either attrition rate. Of the total rates reported, attrition ranged from 6% to 41%. Of the intervention rates reported, attrition ranged from 8% to 42.8%. According to Lyles et al. (2007), best-evidence behavioral interventions require attrition rates of 30% or less in each randomized group for the intervention outcomes to be considered seriously. There were three studies that reported a total sample attrition rate over 30% (Babamoto et al., 2009; Corkery et al., 1996; Tang et al., 2014), and one study that reported an intervention group attrition rate (Tang et al., 2014) over that threshold.

Outcome Variables

Outcome variables can be categorized by self-care behavior-, knowledge-, mental health and well-being-, physical health-, and other- outcomes not otherwise categorized (see Table 3a). Data on self-care behaviors were provided in 13 studies; however, there was little consistency in the specific outcome variables measured and instruments used. The most commonly assessed variable was diabetes self-care practices. It should be noted that other studies, such as Kollannoor-Samuel et al. (2016), examined other such behaviors (e.g., physical activity, healthy eating) that would fall under a larger umbrella

of self-care practices. Data about diabetes knowledge were presented in nine studies; the most common variable assessed was global diabetes knowledge. Data about mental health and well-being outcomes were provided in nine studies. The most common outcome variable assessed was diabetes distress. Data about physical health were provided in all studies; the most common outcome variables assessed were A1c and blood pressure. Non-categorized outcomes included diabetes care priorities, needs related to diabetes and non-diabetes care, quality of diabetes care, collaborative relationships with health providers, and therapeutic cohesion and alliance. Three of the 17 studies investigated these outcomes with no overlaps between them. Due to the limited presence of these outcomes in this literature, it is difficult to make informed conclusions regarding patients' experiences.

[Insert Table 3a here]

Findings

Results of the CHW interventions are presented in Table 4a. Additionally, the following main foci across studies' results are presented below:

Physical health. The majority of studies reported a significant reduction in A1c levels for participants receiving a CHW intervention (see Table 5a). This indicator is a hallmark gauge of long-term glycemic control (Mayo Foundation for Medical Education and Research, 2016). There was inconsistency in findings regarding the sustainability of improvements in A1c, however. Perez-Escamilla et al. (2015) reported improvements over 18 months; Prezio et al. (2013) found improvements ongoing for the duration of the study with greater improvements after the first six months; Rothschild et al. (2014) reported maintained improvements over two years; Tang et al. (2014) demonstrated

improved A1c at 6-months post intervention, but these improvements were diminished at 18 months.

Food label use and diet quality were also found to mediate the relationship between a CHW intervention and improvements in glycemic control (Kollannoor-Samuel et al., 2016). Patients using food labels as a dietary tool and who reported a higher quality diet experienced a significant improvement in metabolic control. Additional physiological risk factors positively impacted by CHW interventions included reduced blood pressure (Gary et al., 2003), waist circumference (Tang et al., 2014), and weight (Rothschild et al., 2014).

Diabetes knowledge. Findings from the studies reviewed commonly concluded that CHW interventions had significant impacts on patients' diabetes knowledge (e.g., Babamoto et al., 2009; Corkery et al., 1997; Wagner et al., 2015). However, while Corkery et al. (1997) reported significant improvements upon completion of the diabetes education program in diabetes knowledge scores, they could not prove that the improved outcomes were a result of the CHW intervention per se.

Self-care behaviors. Several studies reported significant improvements in patients' medication adherence (Babamoto et al., 2009; Batts et al., 2001; Heisler et al., 2014), dietary adherence (i.e., fruit and vegetable intake; Babamoto et al., 2009; Batts et al., 2001; Kollannoor-Samuel et al., 2016; Rothschild et al., 2014), and physical activity (Batts et al., 2001; Gary et al., 2003; Rothschild et al., 2014; Spencer et al., 2011). Corkery et al. (1997) noted significant changes in reported self-care behaviors at the end of the study, but a causal relationship between the CHW intervention and these behaviors was not supported. Additionally, Kenya et al. (2014) found a discrepancy between patient

reports of glucometer use and their blood glucose self-monitoring (BGSM) reports, concluding that the CHW intervention may improve glycemic control without demonstrating a change in BGSM practices.

Mental health and well-being. Five of the studies reviewed reported significant findings in participants' mental health and well-being. Heisler et al. (2014) found improvements in patients' self-efficacy and diabetes distress when the CHW used an e-Health tool as compared to print materials in providing decision-making support. Spencer et al. (2013) noted no impact from the intervention on PHQ-9 scores, but PHQ-2 scores did drop when researchers used the "average intervention effect" (i.e., combining the pre-intervention to post-intervention effects for the immediate and delayed groups) and adjusted for demographics (gender, age, and education). Further, these researchers found diabetes-related emotional distress scores were reduced even further within the immediate intervention group from six to 12 months. Tang et al. (2014) also found improvements in diabetes distress at 18-month follow-up. Testing a CHW-delivered stress management intervention, Wagner et al. (2016) maintained that diabetes education was associated with significant improvements in depression and anxiety, and that increased attendance in said education was associated with greater improvements in both A1c and disease-related stress. Finally, Rothchild et al. (2014) evaluated a CHW-delivered intervention on self-management training; they found that self-efficacy increased significantly during the study in both intervention and control groups (with no significant between-group differences).

[Insert Tables 4a and 5a here]

Discussion

This systematic review highlights several important findings within the RCTs that have been conducted studying the effectiveness of CHW-delivered interventions on T2D care. Results have implications for both clinical practice and future research. Implications for clinical practice are discussed on a more global level regarding the larger shift in healthcare toward a more comprehensive approach. Additionally, more specific implications are also presented with respect to the design and implementation of CHW-led diabetes interventions.

Implications

The Triple Aim of healthcare – improving patients' experiences of care, improving the health of populations, and reducing per capita costs of care – should be at the heart of comprehensive care (Katon & Unützer, 2013). The findings of this review highlighted psychological and social factors often contributing to patients' T2D management. While one response to boost comprehensiveness is to layer-on an abundance of screenings and tests, this effort fails in respect to the third aim of reducing costs and would likely hurt patients' care experience(s). Medical providers, mental health providers, and the larger healthcare system are tasked to be knowledgeable about the primary concerns research has highlighted for the population being served (e.g., patients with T2D), and must be strategic in their delivery of screenings and interventions that have demonstrated effectiveness.

With the growing need to provide comprehensive healthcare, more research investigating non-traditional approaches that simultaneously enhance patient care and boost cost savings is warranted. Further investigation targeting the mechanisms of change

in the delivery of a CHW intervention (e.g., optimal dosage) would advance these aims. Furthermore, three of the 17 studies reviewed addressed the social contributions and/or complications to patients' management of diabetes. Managing T2D is a social issue. Spousal and family support and involvement can be the biggest predictor of treatment adherence (Tang, Brown, Funnell, & Anderson, 2008; Whittemore, Melkus, & Grey, 2005); conversely, it can present major obstacles, such as difficult changes in family roles and responsibilities (Batts et al., 2001). There is a need to evaluate the social impact of this disease on the patient as well as on the patient's social network. Consideration of the bidirectional impact between the patient and his/her social network is supported by foundational theories/models in the field (e.g., biopsychosocial model of health, symbolic interactionism theory, social networks and social support model). CHWs are uniquely positioned as a bridge between the patient and medical system to assist patients in improving the social support received and managing implications of their disease on their social network (McEwen, Pasvogel, Gallegos, & Barrera, 2010).

An additional direction for future research geared toward improving patient care and cost savings is to further examine the impact of CHWs on emergency department (ED) or hospital admissions. In the studies reviewed, there was very limited attention to this type of resource utilization, and in the few studies that examined it there was a discrepancy in findings. As alternative approaches to support patient care for T2D and other chronic conditions continue to gain momentum, examining their impact(s) on outcomes such as ED and hospital admissions provide valuable information about potential changes in the physical and psychological/social health of patients.

Strengths and Limitations

The studies included in this review were strengthened by their robust research designs (i.e., RCTs), which served to maximize internal validity and provide objective information about the effectiveness of CHWs. Focusing solely on CHWs allowed us to tease out the effectiveness of CHW-delivered interventions, also increasing internal validity. Additionally, researchers tested the effectiveness of a CHW intervention on patients' physiological outcomes, mental health outcomes, and knowledge and behaviors, which provided valuable data about the interconnectedness of the mind and the body.

There are also important limitations of this review. The impact of the intervention is dependent on its delivery. In failing to report information about CHW training and evaluation, confidence in some of the results is weakened. This is primarily due to the consumer not knowing how closely the CHW adhered to the study protocol and design. Further, in working toward streamlining the process of using CHWs in patients' care and determining the minimum dose needed to produce the desired patient health outcomes, consistency in intervention dose reporting is needed. Our reporting and assessment of RCTs was limited to published data; therefore, the results of evaluations done by health departments, community programs, or private healthcare organizations that were not published were not included in this review, potentially limiting its scope. I also did not include studies referring to this work by another name (e.g., lay health workers) and studies including other team members as a part of the intervention to provide a more focused assessment of the effectiveness of CHWs in particular. This potentially limited the scope, but not the specificity, of this review.

Conclusion

As T2D continues to increase in prevalence, an assessment of the effectiveness of alternative approaches to patient care is needed. Literature evaluating the impacts of CHW interventions has reported positive findings on patients' biopsychosocial health outcomes; however, research has not gotten to the point yet where the most important and effective methods of CHW training and intervention foci and dosages are well understood. The advancement of comprehensive healthcare alongside future research that evaluates social factors and resource utilization will further inform and advance our efforts.

Article 2

Mixed-Method Evaluation of a Community Health Worker Intervention for Type 2 Diabetes: A Pilot Study

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Dissertation Article 2

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Synopsis

***Introduction*:** The use of Community Health Workers (CHWs) to serve as a liaison and connect patients to the medical system offers an alternative approach to diabetes care. Preliminary research has found significant improvements in patients' health as a result of CHW-delivered interventions, yet the mechanisms of change remain unclear.
***Method*:** Quantitative data from 28 patients diagnosed with Type 2 diabetes (T2D) were collected at three time points over a one-year CHW-delivered intervention. Mixed linear modeling tested change in patients' T2D self-care behaviors, emotional distress, and perceived social support. Additional phenomenological data were collected from 10 participants assessing their experience of the relationship between the intervention and changes in their physical, mental, and social health. These data were analyzed via thematic analysis.
***Results*:** Results from mixed linear modeling revealed a significant improvement in perceived social support from a special person from baseline to 6-months and in dietary adherence from baseline to 12-months. Thematic analysis identified major themes including the role of the CHW as a coach, advocate, teacher, and confidant. Additional major themes were focused on tangible support from family members, and viewing diabetes as a part of a larger, more complex picture.
***Discussion*:** Including a CHW in T2D patient care has significant implications for patients' T2D self-care behaviors and perceived social support. Findings from this study highlight the need for future research to tease out how much of the changes associated with CHW-delivered interventions are due to the therapeutic relationship versus the tasks and processes involved.

Keywords: *Chronic Illness, Community Health Workers, Diabetes, Type 2 Diabetes*

A wealth of knowledge exists regarding evidence-based treatments (e.g., medications, lifestyle changes) for managing Type 2 diabetes (T2D), yet many patients and their families continue to struggle in their efforts to achieve treatment goals (Rushforth, McCrorie, Glidewell, Midgley, & Foy, 2016). Community Health Workers (CHWs), as a supplement to standard care, are uniquely positioned as members of patients' care teams to bridge patients with medical systems' often complex, confusing, and/or difficult-to-access resources. Research evaluating the effectiveness of CHWs has shown positive changes in patients' self-care behaviors, physical well-being, and mental health (Heisler et al., 2014; McDermott et al., 2015; Rothschild et al., 2014). However, the mechanisms of change within this approach remain understudied.

People with T2D have been shown to be at greater risk of experiencing symptoms of emotional distress (e.g., fatigue, anhedonia, rumination) than their non-diabetic counterparts (American Diabetes Association, 2014; Bickett & Tapp, 2016), and these symptoms reciprocally hinder good disease management (e.g., poor diet, sedentary lifestyle; Gonzalez et al., 2008; Smith, Pedneault, & Schmitz, 2015). To combat this, social support is recognized as a primary predictor of treatment adherence (Tang, Brown, Funnell, & Anderson, 2008); its presence mediates the effects of depressive symptoms on medication adherence and diabetes self-care (Kim et al., 2015). It can also lower stress, increase self-efficacy, and promote positive health behaviors (Miller & DiMatteo, 2013).

A systematic review of randomized controlled trials testing the effectiveness of CHWs in T2D care revealed overall significant improvements across patients' physical, emotional, and social/relational health (Trump & Mendenhall, in press). However, the majority of studies have focused on physical health – more specifically, targeting change

in metabolic control (A1c) in lieu of attention to dietary and exercise behaviors. Mixed findings have been reported on the effects of CHWs in improving emotional distress (Spencer et al., 2013). Of the known studies to have measured social support, none have tracked potential change in participants' experiences as a result of CHWs. Further, only two qualitative studies have elicited patients' perspectives on the effectiveness of CHW interventions on their health and diabetes management, and only one of these included attention to emotional and social factors (Gimpel et al., 2010; Richardson, Willig, Agne, & Cherrington, 2015). As our health system moves toward more holistic approaches to care, it is necessary to examine the nuances within the relationship(s) between social support, emotional distress, and treatment adherence, and to test new interventions aimed at activating patients' social support (e.g., CHWs) and treatment adherence.

The objective of this mixed-method pilot study was to test the association between a 12-month CHW-delivered intervention and changes in patients' diabetes self-care behaviors, emotional distress, and perceived social support. A sequential, explanatory mixed-method design was selected to gain greater breadth and depth of understanding, and for corroboration (Johnson, Onwuegbuzie, & Turner, 2007). Gaining a better understanding of effective resources (e.g., social support, CHWs) in diabetes management will assist providers to improve patients' health outcomes and care experiences, improve the health of the larger population, and decrease financial burdens to the healthcare system.

Method

Theoretical Conceptualization

This research is conceptualized through the lenses of the biopsychosocial model of health and illness (Engel, 1977) and the double ABC-X model of family stress and coping (Hill 1949; McCubbin & Patterson, 1983). The biopsychosocial model posits that our biological, psychological, and social health are interwoven; they cannot be separated. For example, to fully understand a patient's physical health and adherence to exercise and diet regimens, one must also consider how psychological factors (e.g., depression or anxiety symptoms) and social/relational factors (e.g., family assistance, financial strains associated with healthy food and/or medication purchases) that support or impede adherence. Furthermore, a change in one component of health has ripple effects and produces change in the others. For example, if the patient discussed in the example above begins to receive additional support and encouragement from family members in making healthy meals and exercising daily, it can be expected that this will have an effect on his/her well-being across both psychological health and physical health.

The double ABC-X model of family stress and coping suggests that individual, couple, and familial outcomes following the impact of a stressor or crisis are the by-product of the interaction(s) between the change in demands or stressors, the expansion or adaptation of resources, and one's perception of his or her new demands and resources (see Figure i). For example, the negative effects of one's demands (e.g., increased stress from adopting new diet and exercise regimens) piling up may be mediated by additional personal, familial, and community resources (e.g., increased knowledge, family or peer social support, working with a CHW) and by a shift in perspective from viewing diabetes

as being overwhelming to being manageable. These changes post-crisis may lead to positive coping and adaptation over time.

[Insert Figure i here]

Procedure and Participants

Participants were recruited over a four-month period in 2016 from a Midwestern Family Medicine clinic's diabetes patient panel. Inclusion criteria were: 1) 18 years of age or older; 2) English speaking; 3) documented diagnosis of Type 2 diabetes with an A1c of 8.0 or greater; 4) received care at said clinic for 12 months prior to the study's initiation; 5) agreed to continue to receive care on-site; and 6) agreed to complete a survey at the beginning, mid-point, and end of study. Exclusion criteria were: 1) current pregnancy; 2) inability to make one's own medical decisions; and 3) has a documented end-stage disease. Attempts were made to contact all qualifying potential participants (N = 90); 30 consented to participate, and 28 completed the CHW-delivered intervention (see Table 1b for demographic data). Health outcomes were collected for all 28 participants, and survey data at all three time points were collected for 20 participants. Ten of the 28 participants were randomly selected and invited to conduct an interview lasting 45-60 minutes at the end of the intervention. Interviews were conducted using semi open-ended questions focused on participants' experiences of the CHW intervention and its relationship with changes in their physical, psychological, and social health. Those who completed the interview were provided a $25 gift card. A matched control group was identified from the pool of all potential eligible participants who were not included in the intervention (n = 81).

[Insert Table 1b here]

Community Health Worker Intervention

One certified CHW met with participants bi-weekly in their homes, the medical clinic, or a public location over the course of one year. Certification for this work in the State of Minnesota includes training in the following areas: (a) roles, advocacy, and outreach; (b) organization and resources; (c) teaching and capacity building; (d) legal and ethical responsibilities; (e) coordination and documentation; (f) communication and cultural competency; (g) health promotion competencies; and (h) practice competencies via internship (Minnesota Department of Health, 2017). This CHW received additional training in diabetes management and motivational interviewing. In addition to the in-person visits, electronic communication (e.g., telephone calls, texts) occurred in between in-person visits. The intervention dose varied by patient availability and preference, ranging from 5 to 55 encounters (in-person and electronic) with a mean dose of 28 encounters. The CHW documented all encounters in the electronic health records used by the clinic. The CHW met regularly with the principal investigator and project coordinator to review cases and discuss care plan strategies. The CHW also communicated concerns about participants with their primary care provider and the larger care team as appropriate. The multifaceted nature of this work represents a gold standard manner in which a CHW would function. CHW roles included providing social support, resource linkage, health coaching, diabetes education, and advocacy.

Measures

The following measures were included in analysis (see Table 2b). Primary outcomes included the following health markers: metabolic control / hemoglobin A1c (A1c), body mass index (BMI), and low-density lipoprotein (LDL). Secondary outcomes

included: depression and anxiety symptoms, dietary and exercise adherence, and perceived social support. Depression symptoms were measured using the 9-item Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001); anxiety symptoms were measured using the Generalized Anxiety Disorder Assessment (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006); dietary and exercise adherence were measured from the General Diet and Exercise subscales of the revised Summary of Diabetes Self-Care Activities measure (SDSCA; Toobert, Hampson, & Glasgow, 2000); and perceived social support from a "special person", family, and friends was measured using the Multidimensional Scale of Perceived Social Support (MDSS; Zimet, Dahlem, Zimlet, & Farley, 1988).

[Insert Table 2b here]

Analytic Plan

Quantitative analyses. To identify the control group, matching brackets were created based on the fitted probability of being enrolled. Propensity scores were computed using the 28 intervention participants and 81 potential control participants. Predictors in these brackets included (ordered by priority): age, A1c, smoking status, BMI, number of emergency department visits, number of hospitalization days, optimal care sum (score based on meeting optimal care standards for blood pressure [i.e., 140/90mmHg], A1c [i.e., < 8%], being tobacco free, taking Aspirin daily, and Statin use), insurance type, primary care provider type (faculty or resident), sex, and LDL. Nine brackets were used in total; the three brackets with the lowest probability of being enrolled had three controls matched to each intervention participant based on the nearest

propensity scores. The six highest brackets included all available controls, giving a total of 53 controls matched to the 28 participants.

To test for significant differences in the primary outcomes (i.e., A1c, BMI, and LDL) between pre- and post- intervention for the intervention and matched control groups, paired-sample t-tests were run. Linear mixed models were conducted to test for differences pre- and post- intervention in the secondary outcomes for the intervention group participants (i.e., reported dietary and exercise adherence, depression and anxiety symptoms, and perceived social support). For each scale or sub-scale separately, times were compared using a mixed linear model with one "observation" (case) per person and time, with outcome (dependent variable) the scale value for that person and time, and with random effect person and fixed effect time (baseline vs. 6-months vs. 12-months). Analyses used the restricted likelihood method; adjusted averages are SAS's least-squares means. Post-hoc tests comparing pairs of times used Tukey's HSD.

Phenomenological qualitative analysis. The transcripts were analyzed using Crabtree and Miller's (1991) thematic analysis. This is a process of consolidating, reducing, and interpreting what people have said into meaningful codes, which are then organized and distilled down to form the categories, major themes, subthemes (see Table 3b for analysis stages). Major themes, and subthemes were identified if they were present in at least half of the interviews. This method is well established across the fields of medicine (e.g., Carusone, Loeb, & Lohfeld, 2006; Nutting et al., 2010) and social science research (e.g., Bell et al., 2014; Wasson & Jackson, 2002).

[Insert Table 3b here]

Self-of-the-researcher. As a critical researcher, I must acknowledge and examine my own position, assumptions, and biases that I bring into my work. This involves a continuous process of self-reflection. Specific biases that I must be sensitive to include viewing myself as someone who is functioning in a "helper" or "rescuer" role, as well as how I view mental health providers, females, and students within the hierarchy of medicine (see Appendix D for further detail).

Trustworthiness. Trustworthiness is built upon the ability to persuade an audience that the findings of an investigation are sound. Lincoln and Guba (1985) identified four criteria of establishing trustworthiness: 1) credibility; 2) transferability; 3) dependability; and 4) confirmability. I describe my approach to establishing trustworthiness according to these criteria as follows:

Credibility. I have engaged in several activities that have increased the probability that I will produce credible findings and interpretations (which also increase my findings' internal validity). First, the technique of *prolonged engagement* has required me to invest a significant amount of time to learn the "culture" of the clinic and community, and to build trust with patients over time. I have worked in the clinic in which I conducted my research for three years, and through this have developed strong relationships with both patients and providers. This has allowed me to gain a better understanding of commonalities in the experience of managing Type 2 diabetes within this community. By being a member of patients' care teams and a clinic "insider", patients were more likely to be willing to participate in my study. This familiarity also allowed me to better detect any distortions or misinformation that might show up in the data.

Another activity in gaining credibility, called *persistent observation,* involves a long-term process of engaging with the data and exploring characteristics and elements that may be most relevant to the focus of study. In addition to being immersed in Type 2 diabetes work in my clinical practice, I have read multiple publications and conducted research focused on this topic over the past three years. Finally, the technique of *triangulation* – the use of multiple and different sources and methods – has increased the credibility of my findings. I have gathered both quantitative and qualitative data, interviewed 36% of the final intervention group sample, and contacted participants multiple times and in multiple formats (e.g., phone calls, e-mails) to increase the survey response rate.

Peer debriefing is another technique to increase credibility. This technique involves consultation with a disinterested peer to explore aspects of the research process and the meaning(s) behind each decision that is made. This technique also allowed me to test my hypotheses and gain unbiased perspectives. I have involved my colleague, Dr. Jaime Ballard, as an independent reviewer. I selected Dr. Ballard because of my confidence in her competence in conducting qualitative research, and because this is a topic she is less familiar with or invested in.

Finally, *member checking* is a process of testing analytic categories, interpretations, and conclusions with members of the group from whom data were originally collected. I was able to solicit feedback from all participants who were interviewed (representing, again, 36% of the final intervention group sample). I provided a summary of the main points gathered from their responses to the interview questions, and then invited participants to edit and/or add to their responses. I documented their

responses verbatim and tested these against my categories, major themes, and subthemes to identify any potential discrepancies.

Transferability. This criterion refers to the degree to which results can be generalized or transferred to other contexts, thereby increasing external validity (Lincoln & Guba, 1985). In my own work, transferability involves both the generalizability of the results to other CHWs (i.e., the results of this study are not solely due to this particular CHW) and to other populations (i.e., similar results would be found for different populations; Krefting, 1991). I have promoted transferability in my research by clearly describing the research context, including the CHW, intervention design, and sample.

Dependability. Dependability refers to the degree to which others would find similar results as mine in subsequent iterations of a study (Lincoln & Guba, 1985). My advisor, Dr. Tai Mendenhall, performed external audits of my work, including reviewing all 10 transcripts multiple times and independently coding them. I selected Dr. Mendenhall to be my primary auditor due to his knowledge on, and experience with, qualitative research and diabetes. Dr. Mendenhall also reviewed preliminary analysis drafts, personal and analytical memos, and other components of my audit trail regularly. Said another way, he examined both my process as well as my product – the data, findings, and interpretations. Dr. Ballard also performed an independent review of two transcripts and coded them.

*Confirmability***.** The major technique for establishing confirmability is conducting a detailed audit trail (Lincoln & Guba, 1985). I created a detailed audit trail to document the development and evolution of my research and personal experiences, thoughts, and questions along the way. My audit trial and supplemental electronic files include the raw

(de-identified) data, detailed summaries of the data, working hypotheses and questions, personal and analytic memos, the development of my categories, major themes, and subthemes, and interpretations and inferences. As a part of my personal memo-ing, I used the technique of *reflexivity* to acknowledge my influence at every stage of the research process. Specifically, I wrote about my thoughts, feelings, and questions while conducting the interviews. I also did this throughout my analysis. These memos were reviewed and discussed at multiple points with Dr. Mendenhall; notes from these discussions are also included in my audit trail.

Results

Quantitative Analyses

Of the 30 participants who initially enrolled, two became unresponsive to the CHW's attempts to contact and were thereby removed from the final sample.

Primary outcomes. Results of the paired-sample t-tests showed no significant difference between pre- and post- intervention for either the intervention or matched control group in A1c, BMI, and LDL levels.

Secondary outcomes. A mixed linear model showed significant difference between time points for dietary adherence ($F(2, 46) = 3.74$, $p = 0.03$; see Figure 1b); it increased from baseline (*adj M* = 6.4, *SE* = 0.9) to six-months (*adj M* = 6.6, *SE* = 0.9), and increased again between 6- and 12-months (*adj M* = 8.5, *SE* = 0.9). Tukey's HSD revealed a significant difference between baseline and 12-months ($p = 0.038$). A second model showed significant difference between time points for perceived social support from a significant other ($F(2, 43) = 3.77$, $p = 0.03$; see Figure 2b); it increased from baseline (*adj M* = 4.7, *SE* = 0.3) to 6-months (*adj M* = 5.5, *SE* = 0.3), then leveled off

from 6- to 12- months (*adj M* = 5.3, *SE* = 0.3). Tukey's HSD revealed a significant difference between baseline and six-months ($p = 0.03$). No other study variables or time points were significantly different.

[Insert Figures 1b and 2b here]

Thematic Analysis

Two major categories and their corresponding major themes and subthemes emerged reflecting participants' experiences of working with the CHW and its relationship with changes in T2D management and overall well-being. See Table 4b for examples organized by categories, major themes, and subthemes.

CHW roles. The analysis identified a major theme regarding the roles of a CHW, including the following categories: (a) coach, (b) advocate, (c) teacher, and (d) confidant.

CHW as coach. The majority of participants acknowledged the valuable influence of the CHW as a coach with respect to managing their T2D. Two primary subthemes emerged within this category. First, participants discussed how having regular check-ins with and getting reminders from the CHW were particularly helpful. These interactions varied between in-person visits at participants' homes or in the clinic, via phone calls, and text messages. In one participant's discussion about what she thought was most helpful about working with the CHW, she stated, "Coaching, her coaching me, calling me with the reminder calls, seeing how I was doing periodically with me being in and out of the hospital stays and still calling me, giving me the courage, to check in on me." (I6, p. 1). Second, participants noted that they were more engaged in care processes as a result of having the CHW coach them. Participants discussed how the CHW motivated them to

seek out medical care when needed, and to stay on-track and focused on their disease management.

CHW as advocate. Participants' responses overwhelmingly described the CHW as being an advocate for them, both within their care and personally. This advocacy was revealed in four primary ways. First, participants discussed how the CHW had connected them to resources, both diabetes-related and otherwise (e.g., food shelves, housing). One participant shared:

> Well, she did a lot for me. She helped me get my cane. She helped me get the necessities that I needed to get on in my daily life like my shower bench. She made things possible for me to live in everyday life that I have struggled. (I6, p. 2).

The second mode of advocacy was the CHW working out problems in care processes (e.g., insurance coverage, filling prescriptions, accessing specialists). The third mode was assisting in tasks like scheduling appointments and finding non-medical information. The fourth mode was in collaboration with participants' care team. Participants discussed the importance of having the CHW attend medical appointments with them, noting that it was helpful to have her take notes during visits and/or prompt them to share information with their physician that they might otherwise have forgotten.

[Insert Table 4b here]

CHW as teacher. Participants discussed gaining a deeper understanding of T2D and how to manage it from the CHW. Several examples that participants shared highlighted challenges in understanding medication regimens and/or the purpose behind certain self-care activities (e.g., checking blood glucose consistently), and how the CHW

successfully translated this information into everyday language. The majority of participants also noted progress that they had made in better managing T2D (e.g., improvements in diet and exercise, metabolic control) as a result of gaining better understandings.

CHW as confidant. Participants overwhelmingly described the CHW as a major source of support, comfort, inspiration, and motivation. They discussed receiving support from the check-ins and from talking about things related to T2D and other life stressors. They described the CHW as "supportive" (I2), "caring" (I5), "shows concern" (I6), "easy to talk to" (I7), and "a good listener" (I8). These qualities and actions facilitated a meaningful sense of connection and comfort. Participants also described the CHW as being familiar and relatable to them. Some experienced her as being like a close family member, a counselor, or member of their community. These descriptions illustrated the relationship and trust built between the CHW and participants.

Ecological impact. An additional major theme found was the ecological impact of T2D, including: (e) receiving tangible support from family members, and (f) viewing diabetes as a part of a larger, more complex picture.

Tangible support from family members. Participants primarily talked about support from family members as being tangible in nature (not emotional). Recollections were focused on participants' T2D management, such as receiving reminders to take medications, check blood glucose, and avoid sugary drinks. A common notion was that support was best received from family members who had also been diagnosed with T2D. Participants said that they found it helpful to compare blood glucose numbers, adopt and maintain lifestyle changes together, or try medications that others had found helpful.

They also said that they were more accepting of feedback and guidance if the other person had personally experienced having the disease too. Many participants also described receiving support from younger generations in their family; they shared how children and grandchildren often check-in regarding disease management more often than as compared with members of the same or older generations.

Diabetes as a part of a larger, more complex picture. In asking about participants' experiences with the CHW and managing diabetes, participants talked about confounding biological, psychological, and social factors. Biological factors commonly described included fatigue, chronic pain, limited mobility, and other concerns that negatively impact self-care. Participants also discussed having less interest in or motivation for disease management when their mood was poor. Psychological factors described included feeling down, anxious, anhedonia, and/or feelings of guilt or shame. Social factors hindering diabetes self-care were described as including limited friendships and avoiding discussing T2D with peers. One participant described having close friendships, but avoiding talking about her diabetes with said friends because "they deal with more anxiety things as opposed to diabetes" (I7, p. 10).

Auxiliary findings. Three other findings emerged from the data that are clinically important to note, but did not qualify as a major theme, category, or subcategory because they were not present in at least half of the interviews. First, several participants talked about the negative impacts of social isolation on their ability to care for their diabetes. Their positive experience of and connection to the CHW was thereby amplified. Second, several participants discussed poverty as being a significant barrier. Many requested information and resources through the CHW to meet basic needs including food, shelter,

and clothing. A third common barrier noted was the presence of significant life stresses impacting diabetes self-care and overall well-being. Participants talked about their experiences of caring for ill spouses, grieving the loss of loved ones, losing jobs, struggling with addiction, and other significant life events that take time and attention from thinking about and managing diabetes. Regardless of what the sources of stress were, participants united in that experiencing heightened stress impeded successful disease management.

Discussion

Results of this mixed-method study provide several noteworthy findings. First, for those working with the CHW, perceived social support from a special person was found to improve from baseline to 6-months and then level off. This finding supports the major theme of the CHW as a confidant for participants. At 6-months, 17% of participants indicated that the CHW was the special person they were referring to, and 22% identified the CHW at 12-months. One possible explanation is that participants who were feeling socially isolated experienced the greatest change early on when they began to receive weekly check-ins. This contradicts Stack's (1975) longstanding thesis regarding strong kinship networks in the African American community. From this thesis, participants' primary support would be expected to already be in place and come from their extended family and/or kinship networks. However, more recent literature points to the erosion of private/social resources and shift toward drawing upon public safety nets (Clampet-Lundquist, Edin, London, Scott, & Hunter, 2004). It may be that the social erosion of connections is a part of larger forces of Westernization (i.e., that value individuation).

It is also possible that the results of my thematic analysis point to T2D as being a socially isolating disease for many, wherein individuals choose to not share their experiences with those around them. Having the CHW inquire about T2D management was likely experienced very differently than other interactions, even from members within participants' social networks. Another possibility is that working with the CHW helped patients to recognize the social support they were already receiving from those in their social network. As managing T2D involves adherence to several strict care regimens that require time, attention, and discipline, it is logical to conclude that one's focus might be primarily on taking care of his/her own health. Intervention processes and tasks, such as talking with the CHW about overall well-being and completing study surveys that asked about social support, might have drawn participants' attention to their social network more so than before.

A second important finding is that dietary adherence improved from baseline to 12-months for those working with the CHW. While other health outcomes did not significantly change over time, participants' ability to follow a healthy eating plan was impacted. Findings from the thematic analysis highlighted the CHW's role of translating medical information and coaching patients. It may be that patients were more easily able to improve dietary adherence than other self-care behaviors, such as exercise, because it is more based on knowledge than action. It is also plausible that one's social support network, such as family members, is able to more directly support these self-care behaviors, such as through what foods are kept in the home or by changing their own eating habits. Previous research highlighting spousal support as one of the strongest

predictors of patient treatment adherence supports this notion (Tang, Brown, Funnel, & Anderson, 2008).

Implications for Clinical Practice and Future Research

Findings from both the qualitative and quantitative data highlight the benefits of including CHWs in T2D care, particularly in the arenas of social support and dietary adherence. This may be especially important for underserved populations, as they endure significant stress and hardship, making adherence and follow-up more difficult. Receiving frequent check-ins and reminders, gaining a better understanding of their health and self-care practices, and getting connected to basic resources may reduce or eliminate several of the barriers that underserved patients often face. While no significant association was found between the CHW intervention and the primary outcomes, it may be that the basic needs (e.g., food security) of underserved populations must be met before higher-level needs and changes (e.g., medication adherence) are possible (Maslow, 1943). For clinics and/or care teams without CHWs, it is imperative for providers to be knowledgeable of and sensitive to many of the challenges and barriers faced by the populations they serve. Specifically, providers are tasked to assess for the bidirectional relationship between patients' emotional and social/relational health and their physical health and T2D management, and to link patients to the appropriate resources.

This research may have additional implications for the hiring and training of CHWs. Results of this study highlight several qualities of the CHW that contributed to the development of meaningful connections. This study also outlined four primary CHW roles that patients identified as being most helpful. This research may inform how health

systems identify CHWs that are well suited to work with the populations they serve, and critical aspects to include in their training.

Future research could build upon this study's theoretical conceptualization via the biopsychosocial model of health to investigate the spiritual component. Increasing attention to spirituality as an additional aspect of patients' health and experience of care may provide important information regarding how patients make meaning, cope with, and adapt to having T2D, and may offer additional resources and supports.

Additionally, more research that investigates the mechanisms of change in CHW interventions is warranted. CHWs' work is complex, making it difficult to capture data to reflect the real impacts of this innovative supplement to standard care. Specifically, it remains unclear how much of the changes seen are based on fostering trusted therapeutic relationships with patients. Future research is needed to tease out if the CHW is the true intervention (e.g., the therapeutic relationship, receiving social support and regular check-ins) as opposed to the process and tasks involved in working with a CHW (e.g., gaining diabetes-related knowledge, more consistent blood glucose monitoring).

Strengths and Limitations

This is one of the first studies targeting CHWs to conduct a mixed-method analysis using biological and psychosocial measures. This design provided both breadth and depth of understanding; the quantitative analyses tested the association between the intervention and changes in health outcomes, and the qualitative interviews provided the richness of participants' lived experiences and corroborated the quantitative findings. The high retention rate also strengthened this study.

Alongside these foci, there are also limitations that are important to consider. First, using self-report instruments may introduce response bias (social desirability) into the results. To account for this, the present study included health outcomes in addition to self-report instruments; however, only two time points were included for A1c, BMI, and LDL. Future research would benefit from additional – and more frequent – collection of health outcomes data. Additionally, the lab equipment used to analyze A1c levels capped at 14% (i.e., any A1c values higher than 14% were charted as ">14"). It is recommended that more sensitive equipment be used to gain a more specific A1c levels for these extreme cases. An additional limitation was not conducting peer debriefing with a member of the community, such as a CHW. This would further increase the credibility of findings and potentially provide a richness or detail that might not otherwise be considered. This study was also limited to only one CHW, restricting the sample size. Future research that includes multiple CHWs and a larger intervention sample is more likely to detect potential change in health outcomes and/or to further dissect the CHW interventions' mechanisms of change. Finally, the length of this intervention limited the possibility of detecting slower-developing changes, particularly in patients' biological health markers. Research testing the effectiveness of CHW-delivered interventions over a longer period of time might reveal additional significant changes.

Conclusion

This study explored the association between a CHW intervention and changes in patients' T2D self-care behaviors, emotional distress, perceived social support, and health outcomes. Findings make a case for the inclusion of CHWs in care teams to bolster patients' perception of support, and to motivate them to engage in disease management

and self-care processes. Future research is indicated to elucidate specific mechanisms associated with clinical change, and to inform the personalization of CHW interventions within and across underserved populations.

Global Implications of the Two Studies

Global implications of the two studies include both implications for my program of research and implications for clinical practice and next steps.

Implications for my Program of Research

The long-term goal of this program of research is the widespread implementation of effective and sustainable support for patients managing Type 2 diabetes. Preliminary literature has shown that the inclusion of CHWs in patient care teams assists in bridging the patient and medical system together, yet much remains unknown regarding the feasibility of a CHW-delivered intervention and its effect on patients' physical and psychosocial well-being.

In conducing the systematic review presented here (Article 1), I learned that there is great variation in the design and implementation of CHW-delivered interventions across the existing body of literature. Lack of consistency in intervention dosage and methods of CHW training in particular cloud what can be stated with confidence about the impact of CHW interventions. It is evident that CHW-delivered interventions are impactful; however, existing literature has not yet examined primary mechanisms of beneficent clinical change.

Findings from the research study (Article 2) suggest that patients in underserved communities face many barriers that impede T2D management, potentially moderating the relationship between the CHW intervention and patients' health outcomes. My thematic analysis revealed that one of the most common ways that patients' felt assisted by and/or cared for by a CHW was in gaining resources. In fact, the majority of resources noted by participants were not related to their diabetes; rather they were about accessing

food, clothing, housing, employment, and insurance coverage. In considering Maslow's (1943) hierarchy of needs, individuals cannot attend to higher-level needs (e.g., checking blood glucose, attending frequent medical visits) until their basic needs are met (e.g., having consistent food and shelter).

Participants' social isolation and their need and desire for increased social support and connection were also highlighted in the findings of this study. It is not clear if participants' social isolation was a result of their diabetes or other factors. It is plausible that diabetes is a very isolating disease due to negative stigma and disconnects people from the common interwoven character of the African American community. Regardless of the reason, participants' experience of received social support increased considerably when they began working with the CHW. This was also one of the most prominent themes revealed in my thematic analysis. People felt cared for, encouraged by, and supported in their work with the CHW.

Finally, these findings suggest that improvements in health outcomes are likely to be seen over a longer course of time as compared to changes in psychosocial health (e.g., support). As previously discussed, it may be that improvements in social support received, access to resources, increased knowledge, and so on may pave the way for later improvements in physical health markers (e.g., A1c), Indeed, these often take much longer to adjust (Buse, 2003).

Implications for Clinical Practice and Next Steps

There are several broader implications of these findings. Principal clinical implications include support for the inclusion of CHWs in care teams for patients with T2D. The call to move toward more comprehensive care directly connects to the Triple

Aim of health care – improving patients' experiences of care, improving the health of populations, and reducing per capita costs of care. Specifically, the provision of comprehensive care addresses the health of patients, along with often confounding psychological and social factors that directly impact overall well-being. CHWs are uniquely positioned to work with patients to address these factors – factors that the medical system is conventionally not equipped to address secondary to a variety of reasons (e.g., lack of time, resources, and/or staff with these job responsibilities).

In instances where health systems are not yet able to include CHWs in their practice, medical providers, mental health providers, and the larger healthcare system must be knowledgeable about common factors or barriers plaguing their patients, especially if they are working with underserved populations. This, in turn, allows the care team to be tactical in their delivery of evidence-based screenings and interventions and in connecting patients to community resources. Furthermore, it is recommended that these health systems focus on the development of business plans that sustain CHW positions. Done strategically, the addition of CHWs can potentially increase clinic revenue as patients' engagement in care processes and follow-up increase. This, in turn, is also likely to create a medical offset effect by reducing unnecessary use of services (e.g., emergency room visits, costs associated with diabetes-related complications; Crane & Christensen, 2014).

In moving toward a more comprehensive delivery of care, future research should further investigate the primary mechanisms of change in CHW interventions. I believe that quantitative and qualitative methods are often best used in tandem to gather data on both significant effects of the intervention and the experience of the intervention. Both

types of data are essential to align with the Triple Aim of Healthcare. While quantitative research is able to illuminate changes in the health of populations and the per capita cost of health care, it is qualitative research that taps into patients' experience of care (including quality and satisfaction).

Future research can address limitations of my study (Article 2) by including a larger sample size and multiple CHWs. This would provide more data to distinguish between if outcomes found are a result of the CHW or the intervention process and/or tasks. Additionally, because health outcomes like A1c tend to change more slowly, testing the effectiveness of longer-term interventions and additional follow-ups post-intervention time points would provide valuable data.

Conclusion

The experience of working within the community that this research was conducted in was very informative to my development as a researcher, clinician, and human being. In a research sense, these studies advanced the body of literature by one or two steps (as it typically goes with developing a body of literature). However, through working with and talking to these participants, it was clear that for many, this intervention was life changing. This became most evident in participants' reactions to the intervention concluding when the grant funding ended. One participant described the termination of the CHW service and relationship, saying, "That's like . . . saving a man from the ocean, [and then] put him on a boat and then push him back out, you know?" (I10). Others discussed not knowing what to do when the CHW would not be calling them anymore to check in. Many shared about how she became someone who they were able to share aspects of themselves with; a close friend and confidant. One participant

said, “I don’t want to lose [CHW] right now. She’s somebody that I can connect with and connect to.” (I8).

As a clinician and person, these experiences speak volumes to me regarding the importance of this work. Even during the most challenging and tiring parts of conducting, analyzing, interpreting, and writing up this research, my energy has stemmed from these patients’ experiences and the value that it brought to their lives. I believe that regardless of how my individual program of research develops over my career, if I am able to remain focused on conducting scholarship that touches peoples’ lives – that is impactful – I will continue to find the energy and determination needed to engage in this work. Clinical research is complex and messy – but so are the landscapes of our patients’ lives, and the healthcare systems that we advance to assist them in coping, healing, and growth.

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* Indicates articles included in review
[#] Indicates articles identified in tables

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Table 1a

Inclusion of Theory

	Article	Theories Identified
Explicit Use of Theory	[4]	Precede-Proceed model (Green & Kreuter, 1991)
	[1, 10]	Stages of Change model (Prochaska & Velicer,1997); Motivational Interviewing (Miller & Rollnick, 1991); Chronic Care Model framework (Wagner et al., 2001)
	[11]	Social Cognitive theory (Bandura, 2001)
	[13, 14]	Socioecological model and empowerment theory (Anderson & Funnell, 2005)
Missing Theory	[2]	---
	[3]	---
	[5]	---
	[6]	---
	[7]	---
	[8]	---
	[9]	---
	[12]	Described elsewhere
	[15]	---
	[16]	---
	[17]	---

Table 2a

Community Health Worker Intervention

Article	Training*	Intervention Topics	Dose (Intensity / Duration)	Attrition (% total / % in CHW intervention)	Participant Recruitment
[1]	Education: 6-week training curriculum Experience in training: NR Evaluation: NR	Diabetes knowledge (1st role) Identified problems (2nd role) Goals Level of Progress Barriers and Issues Problem-solving	10 individual education sessions + follow-up phone calls (mean = 11 sessions) / 6 months	41% / 28%	Recruited during routine clinic visits
[2]	Education: NR Experience in training: NR Evaluation: NR	Healthy eating Physical activity Medication adherence Appointment adherence (3rd role) SMBG** Foot care Smoking cessation	3 visits / 2 years	NR /NR	NR
[3]	Education: NR Experience in training: NR Evaluation: NR	Reinforced self-care instructions Appointment adherence	NR number of clinic visits + NR number of diabetes education sessions / duration varied	37% / 20%	NR
[4]	Education: NR Experience in training: NR Evaluation: Met bi-weekly with nurse case manager	Appointment adherence Diabetes knowledge Behavior monitoring Adherence to treatment Social support (4th role) Physician Feedback	6 visits + additional contacts as needed (mode = < 3 visits) / 2 year	16% / NR	Medical chart review
[5]	Education: 80 hours + 4-8 hours of booster training annually Experience in training: NR Evaluation: NR	Diabetes knowledge Medication adherence Barriers Patient goals Action plans	1-2 hour session + 2 follow-up calls / 2 years	6% / NR	Medical chart review

[6]	Education: NR Experience in training: NR Evaluation: NR	BGSM Medication adherence Lifestyle behaviors	Visits as needed (mean = 8 visits) / 1 year	NR/ NR	NR
[7]	Education: Additional training in unknown amount Experience in training: NR Evaluation: Interviews and educational sessions monitored	Nutrition knowledge Physical activity Diabetes knowledge Mental and cardiac health BGSM Medication adherence Appointment adherence	17 visits / 1 year	17% / NR	Recruited during routine clinic visits at primary care clinic
[8]	Education: 3-week training + 2 workshops during intervention Experience in training: NR Evaluation: NR	Appointment adherence Medication knowledge Nutrition Smoking cessation Foot care Self-management skills	Visits as needed (mean NR) / 2 years	10% / 17%	Recruited during routine clinic visits at primary care clinics
[9]	Education: NR Experience in training: NR Evaluation: NR	Barriers to care Goal setting Needs assessment Referrals Nutrition and exercise knowledge	4 individual visits + 10 group sessions + 10 follow-up phone calls (medians = 3 visits, 0 group sessions, and 10 phone calls) / 1 year	15.5% / 18.8%	Recruited during routine clinic visits at primary care clinics
[10]	Education: 65 hours of training + 25 supplemental hours Experience in training: NR Evaluation: Weekly meetings with field supervisor and health management team	Diabetes knowledge Healthy lifestyle behaviors Nutrition BGSM Medication adherence Appointment adherence Mental health	17 sessions / 1 year	29% / 24.8%	Medical chart review
[11]	Education: 27 hours of training Experience in training: NR Evaluation: Competency assessment and clinical observation	BGSM Nutrition Medication adherence Smoking cessation Physical activity Diabetes knowledge	7 sessions (mean = 7) / 1 year	14.4% / 8%	NR

		Referrals			
[12]	Education: 100 hours of training Experience in training: NR Evaluation: NR	Diabetes knowledge Diabetes management skills Goal setting Problem-solving skills Modifying home environment to support behavior change Social support Stress management	36 visits (mode = < 13 visits) / 2 years	16% / 20.5%	Direct mailings, outreach at community events and churches, partnerships with primary care clinics, and direct outreach by CHW
[13]	Education: 80 hours of training Experience in training: NR Evaluation: NR	Diabetes knowledge Diabetes management skills Communication skills with medical providers Referrals	2 home visits per month + 1 medical visit + 11 education classes (mean = 8 classes) + follow-up phone calls every two weeks / 6 months	17.7% / 18%	Medical chart review
[14]	Education: 80 hours of training Experience in training: NR Evaluation: NR	Stress reduction Physical activity Nutrition Goal setting Communication skills with medical providers Referrals	2 home visits per month + 1 medical visit + 11 education classes (mean = 8 classes) + follow-up phone calls every two weeks / 6 months	17.1% / NR	Medical chart review
[15]	Education: 160 hours of community outreach training + 80 hours of specific training Experience in training: NR Evaluation: NR	Goal setting Mental health Diabetes self-management skills Action plans Emotional support Resource utilization	11 2-hour group classes in initial 6 months + 2 home visits per month + monthly follow-up phone calls / 18 months	41% / 42.8%	Medical chart review
[16]	Education: NR Experience in training: NR Evaluation: NR	Diabetes knowledge Nutrition Medication adherence Physical activity BGSM Physical relaxation	8 group education sessions (mean = 5 sessions) / 8-10 weeks	NR/ NR	Medical chart review

[17]	Education: 150 hours of training Experience in training: Delivered intervention to pilot cohort Evaluation: Supervision of training experience	Nutrition Physical activity Skills training Relaxation exercise	8 group education sessions (mean = 5 sessions) / varied duration	NR/ 22.9%	Medical chart review and recruited during routine clinic visit in a primary care clinic

**Note.* Experience in training did not include experience gained prior to the study.

***Note.* BGSM is blood glucose self-management.

Table 3a

Quantitative Outcome Variables

Category	Outcome Variable*	Instrument**
Behavior Outcomes	1. Behavioral risk factors [1, 6, 13, 14]	1. Behavioral Risk Factor Surveillance System; Michigan Diabetes Knowledge Scale
	2. Medication adherence [1, 5, 12]	2. Morisky Self-Reported Medication Behavior Scale; 4-Item Self-Reported Adherence Measure; MEMS 6 Track Cap
	3. Health behaviors [2]	3. NR
	4. Diabetes self-care practices [3, 4, 10, 12, 13, 14, 16]	4. Patient Self-Reported Behaviors Rating Scale of Diabetes Self-Care Practices; Summary of Diabetes Self-Care Activities Scale
	5. Physical activity [4, 7, 14]	5. Dietary Risk Assessment; ADA guidelines
	6. Healthful eating [4, 7, 14]	6. Food Frequency Questionnaire; Food Label Questionnaire, Healthy Eating Index
	7. Self-reported health status [16]	7. 1-item from National Health Interview Survey
	8. Home skills [17]	8. Weekly diary entries
Knowledge Outcomes	1. Diabetes knowledge [1, 3, 7, 10, 17]	1. Diabetes Knowledge Questionnaire; Diabetes knowledge test developed for Gary et al. (2003); Diabetes-related knowledge survey developed by Kollannoor-Samuel et al. (2016); 10-items from DIALBEST
	2. Medication knowledge and decision-making [5]	2. The Diabetes Mellitus Medication Choice Aid; Decisional Conflict Scale; Statin Choice
	3. Health Literacy [8]	3. Functional Health Literacy for Adults
	4. Diabetes self-management knowledge [13]	4. 1-item validated question
	5. Medication changes [11]	5. Computerized pharmacy records
Mental Health and Well-Being	1. Diabetes self-efficacy [5, 12, 13]	1. Diabetes Empowerment Scale; Perceived Competence for Diabetes Scale
	2. Diabetes distress [5, 13, 14, 15, 16]	2. Diabetes Distress Scale; Problem Areas in Diabetes Scale

Outcomes	3. Quality of life [8]	3. Assessment of Quality of Life
	4. Acculturation [10, 12]	4. Marin Instrument to Assess for Acculturation
	5. Social support [10, 12, 15]	5. Personal Resource Questionnaire; Diabetes Support Scale
	6. Diabetes attitudes [10, 14]	6. NR
	7. Mental health [10]	7. NR
	8. Depression [12, 14]	8. Beck Depression Inventory; Patient Health Questionnaire-9 item; Patient-Health Questionnaire-8 item
	9. Stress [12]	9. Perceived Stress Scale; PROMIS Emotional Distress/Anxiety Scale
	10. Anxiety [12, 16]	10. Spielberger State Anxiety Inventory
	11. Treatment expectations [17]	11. Credibility Expectancy Scale
	12. Affect [17]	12. Affect reports
	13. Treatment satisfaction [17]	13. Developed for Wagner et al. (2015)
Physical Health Outcomes	1. HbA1c [1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17]	1. Clinical data
	2. Weight, height, and/or body mass index [1, 10, 11, 15]	2. Clinical data
	3. Blood pressure [2, 4, 8 9, 10, 11, 12, 13, 15]	3. Clinical data
	4. Lipid profile [4, 10, 11, 15]	4. Clinical data
	5. Self-monitored blood glucose [6]	5. Stanford Patient Education Research Center Diabetes Questionnaire
	6. Cholesterol [9, 13]	6. Clinical data
	7. Hip/waist circumference [10, 15]	7. Clinical data
	8. Diabetes-related complications [14]	8. NR
	9. Urinary cortisol [16]	9. Clinical data
Non-Categorized Outcomes	1. Diabetes care priorities [2]	1. Developed for Batts et al. (2001)
	2. Needs related to diabetes care and non-diabetes care [2]	2. Developed for Batts et al. (2001)
	3. Quality of diabetes care [14]	3. NR

4. Relations with health providers [14]	4. NR
5. Therapeutic cohesion and alliance [17]	5. 4-item Outcome Alliance Scale

**Note.* Studies investigating this outcome listed in brackets

***Note.* The instruments listed only include those that were reported by the authors in their manuscripts

Table 4a

CHW Intervention Results

Article	Sample Size (N)	Region	Participant Mean Age in Years	Sex (% Female	Significant Changes in Constructs Measured for CHW Intervention Group	Associated Statistical Significance (p; respectively) / Effect Size (if reported)
[1]	189	Los Angeles, CA	50	64	a. Self-reported health status of "very good" or "excellent" increased from 5% at baseline to 57% at follow-up b. Intake of fatty foods decreased from 29% at baseline to 16% at follow-up c. Intake of 2+ servings of fresh fruit per day and fresh vegetables per day increased from 47% and 39% at baseline to 73% and 76% at follow-up, respectively d. Exercise 3+ days per week increased from 28% at baseline to 63% at follow-up e. Mean Diabetes Knowledge Scale score increased from 10.6 at baseline to 14.7 at follow-up f. Mean A1c decreased from 8.6% at baseline to 7.2% at follow-up	a. < .05 b. < .05 c. < .05 d. < .05 e. < .05 f. < .05
[2]	119	Baltimore, MD	59	75	a. Percentages of needs addressed in first, second, and third visits decreased for healthy eating, physical activity, medication adherence, and insurance	a. < .001; < .001; < .05; < .001
[3]	64	New York City, NY	53	74	a. A1c levels decreased from 11.7 at baseline to 9.9 at post-intervention and sustained at 9.5 at follow-up b. Self-reported knowledge scores improved from 74.4% at baseline and 95.4% at post-test c. Improvements from baseline to follow-up in self-reported adherence to the meal plan, carrying a fast-acting sugar, and performing daily foot care	a. = .004; < .001 b. < .001 c. = .013; < .001; < .001
[4]	149	Baltimore, MD	59	77	a. A 0.26-unit increase in leisure-time physical activity from baseline	a. < .05
[5]	188	Detroit, MI	52	76 (iDecide); 66	a. Within-group mean improvements from baseline to follow-up in medication decisional conflict (11.5, 14.1), knowledge about medications (10.8, 12.8), satisfaction with clarity of medication	a. All < .001/< .001

				(printed materials)		information (13.0, 22.2), and satisfaction with helpfulness of medication information (10.2, 21.5) for printed materials and iDecide, respectively	
					b.	Within-group mean improvements from baseline to follow-up in diabetes self-care efficacy (4.8, 81), medication adherence (5.7, 3.4), and A1c (-0.3, -0.4) for printed materials and iDecide, respectively	b. = .002/< .001; < .001/= .036; = .016/= .001
					c.	Within-group mean improvement of 14.1 for iDecide group from baseline to follow-up in diabetes distress	c. < .001
					d.	Between-group differences in improvement found to be greater for iDecide than printed materials for satisfaction with clarity of information on medications and satisfaction with helpfulness of information on medications	d. = .03; = .007
					e.	Between-group difference in improvement of 15.7 in mean diabetes distress score for iDecide than printed materials	e. < .001
[6]	117	Miami, FL	55	55	a.	A1c values decreased from 10.04 at baseline to 8.80 at follow-up	a. < .001
[7]	203	New Haven, CT	57	73	a.	Food label use improved 16.4% from baseline to follow-up	a. < .001
					b.	A1c levels decreased .52% from baseline to follow-up	b. < .05
					c.	15% of the decrease in A1c levels from baseline to follow-up was associated with food label use to diet quality path	c. < .01
					d.	Within-individuals, A1c values decreased .12% between baseline and follow-up and with respect to diet quality (.11%)	d. < .01; < .05
[8]	213	Adelaide, South Australia	48	62	a.	A1c levels decreased from 10.8 at baseline to 9.8 at follow-up	a. = .018
[9]	360	New York City, NY	58	63 (control), 61(inter-vention)	a.	When separated out from in-person contacts, phone contacts were associated with greater A1c reduction from baseline to follow-up	a. = .04
[10]	211	Hartford, CT	56	74	a.	A1c levels decreased .42% from baseline to 3 months, .47% at 6 months, .57% at 12 months, and .55% at 18 months	a. = .043; = .050; = .021; = .009
					b.	An overall group effect of -.51% was found for A1c with the intervention group having lower A1c levels than the control group	b. = .002
					c.	Fasting glucose was lower for the intervention group than the control group	c. = .002
[11]	180	Dallas, TX	46	67 (control), 54 (inter-	a.	A1c levels decreased .7% from baseline to follow-up, with a greater reduction in A1c for intervention group than the control group	a. = .02; < .001

				vention)				
[12]	144	Chicago, IL	54	67	a.	A1c levels decreased .55 points lower for the intervention group than the control group from baseline to year one (8.35 to 7.87 for intervention group, 8.23 to 8.42 for control group) and .69 points lower from year one to year two (7.87 to 7.64 for intervention group, 8.42 to 8.33 for control group)	a.	= .021; = .005
					b.	Glucose self-monitoring increased from baseline to year two for both groups	b.	Significant (*p* value NR)
					c.	Self-efficacy increased a mean of 4.4 units from baseline to year two for both groups	c.	Significant (*p* value NR)
					d.	Weight decreased 4.82 pounds from baseline to year one and 5.02 pounds from year one to year two	d.	= .041; = .036
					e.	Social support increased 6.7 points from baseline to year one and 12.7 points from year one to year two	e.	= .015; < .001
[13]	164	Detroit, MI	50 (intervention), 55 (control)	75 (intervention), 67 (control)	a.	Mean A1c levels decreased from 8.6 at baseline to 7.8 at follow-up	a.	< .01
					b.	Mean LDL cholesterol levels decreased from 105 at baseline to 95 at follow-up	b.	< .05
					c.	Self-management knowledge improved from baseline to follow-up, with improvements seen in self-management score, knowledge about how food affects blood sugar, and how exercise helps blood sugar	c.	< .01; < .01; < .05, OR = 11.4; < .01, OR = 4.3
					d.	Percent that met guidelines for physical activity increased from 37% at baseline to 53% at follow-up	d.	< .05
					e.	Adherence to inspecting the inside of shoes daily increased from 49% at baseline to 77% at follow-up	e.	< .01, OR = 3.3
					f.	Testing blood glucose as recommended improved from 74% at baseline to 87% at follow-up	f.	< .05
[14]	164	Detroit, MI	53	71	a.	With age and ethnicity added to the model, problem areas in diabetes decreased 6.5 points from baseline to 6 months, with a total reduction of 12.3 months from baseline to follow-up	a.	= .05
					b.	In calculating an "average intervention effect" by combining the immediate and delayed groups, problem areas in diabetes decreased from baseline to follow-up regardless of whether demographics were added to the model	b.	< .05
					c.	When problem areas in diabetes analyses were stratified by	c.	.30 effect for

						race/ethnicity, the outcome was only significant for Latino/as	African Americans and Latino/as combined; .53 effect for Latino/as
					d.	Depression symptoms decreased by 0.4 units from baseline to 6 months for the delayed group, with a difference between the immediate and delayed group of 0.7	d. < .05; .44 effect
					e.	For Latino/as, depression symptoms decreased 1.0 units from baseline to 6 months	e. .53 effect
					f.	With the "average intervention effect", a decrease in depression symptoms was seen from baseline to 6 months	f. .21 effect for everyone; .31 effect for Latino/as
[15]	116	Detroit, MI	49	58.6	a.	A1c levels decreased 5.5 units from baseline to 6 months and maintained a decrease of 4.4 units at 12 months	a. = .004; = .011
					b.	Waist circumference decreased 1.4 inches from baseline to 6 months and sustained a 1.3 inch reduction at 18 months	b. = .0001; = .0001
					c.	Social support improved 0.6 units from baseline to 6 months and sustained 0.4 unit improvement at 12 months and 0.3 units at 18 months	c. < .0001; = .0001; = .050
					d.	High diabetes distress decreased from baseline to 6 months	d. Significant (*p* value NR)
					e.	Moderate diabetes distress levels decreased from 28.6% at baseline to 14.5% at 6 months, and was sustained at 16.2% at 12 months and at 18.8% at 18 months	e. = .013; = .003; = .030
[16]	107	Hartford, CT	61 (DE), 60 (SM+DE)	72 (DE), 74 (SM+DE)	a.	Depression symptoms increased from 5.3 units at baseline to 6.2 units at post-treatment for diabetes education (DE) group and decreased from 6.7 units at baseline to 4.7 units at post-treatment for stress management and diabetes education (SM+DE)	a. .002, r^2 = .082
					b.	Anxiety symptoms increased from1.8 units at baseline to 2.9 units at post-treatment for DE group and decreased from 1.9 units at baseline to 1.7 units at post-treatment for SM+DE	b. = .005, r^2 = .077
					c.	Self-reported health worsened from 3.3 units at baseline to 3.4 units at post-treatment for DE group and decreased from 3.5 units at baseline to 3.1 units at post-treatment for SM+DE	c. = .023, r^2 = .048
					d.	Number of sessions attended was associated with A1c; compared to	d. = .002, r^2 =

						baseline, at post-treatment each additional session attended was associated with a 0.21 decrease in A1c and at follow-up was associated with a 0.19 decrease in A1c	.092; = .004
					e.	Compared to baseline, at post-treatment each additional SM session was associated with a 0.6 point decrease in diabetes distress score	e. = .047, r^2 = .060
[17]	107	Hartford, CT	60	73	a.	Diabetes knowledge scores increased from 62% correct at baseline to 76% correct at follow-up	a. = .000
					b.	In-session relaxation exercises increased positive affect and decreased negative affect from baseline to follow-up	b. = .001

Note. OR = odds ratio. r^2 = R-squared. effect = Cohen's D effect size. NR = not reported.

Table 5a

Main Foci in Findings

Theme	Articles Supporting Theme
Significant impact on physical health	[3, 4, 5, 6, 8, 10, 11, 12, 13, 15, 16]
Significant impact on diabetes knowledge	[1, 3, 6, 17]
Significant impact on self-care behaviors	[1, 2, 3, 4, 5, 7, 12, 13]
Significant impact on mental health and well-being	[5, 12, 14, 15, 16]

Table 1b

Demographic Information for Study Participants

Indicator		Patient (N = 28)
Age (Average) [M(SD)]		39(9.50)
Race [Freq(%)]		
	Black or African-American	21(75.0%)
	White or European-American	3(10.7%)
	Hispanic or Latino/a	---
	American Indian/Alaska Native	---
	Asian/Pacific Islander	1(3.6%)
	Other/Unknown	3(10.7%)
Employment [Freq(%)]		
	Employed	5(17.9%)
	Unemployed	7(25.0%)
	Not Reported	16(57.1%)
Insurance Type [Freq(%)]		
	Dual Medicare/ Medicaid	7(25.0%)
	Medicaid/MHCP	17(60.7%)
	Medicare	2(7.1%)
	Employer-Based Insurance/Self-Insured	1(3.6%)
	Other	1(3.6%)

Table 2b

Description of Measures

Measure	Items (n)	Range of Possible Responses	Scoring	Example of Items	Cronbach's alpha reliability estimates (α)
Patient Health Questionnaire	9	0 (*not at all*) – 3 (*nearly every day*)	Higher scores indicated a greater number of depression symptoms	"Little interest or pleasure in doing things" "Feeling down, depressed, or hopeless"	.90
Generalized Anxiety Disorder Assessment	7	0 (*not at all*) – 3 (*nearly every day*)	Higher scores indicated a greater number of anxiety symptoms	"Feeling nervous, anxious, or on edge" "Becoming easily annoyed or irritable"	.89
General Diet subscale of the revised Summary of Diabetes Self-Care Activities measure	2	0 (*0 days*) – 7 (*7 days*)	Higher scores indicated greater dietary adherence	"How many of the last seven days have you followed a healthful eating plan?" "On average, over the past month, how many days per week have you followed your eating plan?"	.96
General Exercise subscale of the revised Summary of Diabetes Self-Care Activities measure	2	0 (*0 days*) – 7 (*7 days*)	Higher scores indicated greater exercise adherence	"On how many of the last seven days did you participate in at least 30 minutes of physical activity?" "On how many of the last seven days did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?"	.70
Multidimensional Scale of	12	*0* (*very strongly*	Higher scores indicate greater perceived social	"There is a special person who is around when I am in need"	.92

Perceived Social Support		*disagree*) – *6* (*very strongly agree*)	support	"My family is willing to help me make decisions"	
Hemoglobin A1c	---	---	Normal = below 6.0% Pre-diabetes = 6.0 – 6.4% Diabetes = 6.5% and above	---	---
Body Mass Index	---	---	Healthy = 18.5 – 24.9 Overweight = 25 – 29.9 Obese = 30 and above	---	---
Low-Density Lipoprotein	---	---	Optimal = 100mg/dL Above optimal = 100-129mg/dL Borderline high = 130-159mg/dL Very high = 190mg/dL and above		

Table 3b

Thematic Analysis Stages

Stage	Activity
Stage 1	All transcripts were perused, noting emerging topics. The author's advisor also read all transcripts and they discussed initial reflections.
Stage 2	Each transcript was examined independently, recording summaries of its substance, noting any additional topics.
Stage 3	A list of all topics identified from the data was formed, and similar topics were clustered together and abbreviated as codes.
Stage 4	Transcripts were revisited and codes were recorded next to the appropriate segments of text; modifications were noted, and new topics were added to the list as indicated.
Stage 5	The most descriptive wording for codes were identified and categories were created, reducing the total list of codes by grouping related topics together.
Stage 6	Within each category, the major themes were separated out by subthemes, and were assimilated into a comprehensive picture.

Table 4b

Qualitative Findings of Categories, Major Themes, and Subthemes

Categories	Major Themes	Subthemes	General Features	Example Quotations
1. CHW Roles	A. CHW as a coach	1. Regular reminders/check-ins	Telephone calls, text messages, in-person encounters	• *I told you she calls me every – she texts me every day and asks how I'm doing. She asks how much – how I feel and then she asks me how much was my sugar today, did I take it, did I take my medication, and right there that's the helping part. She reminds me sometimes. I get into my feelings and I forget about taking medication and she – at 7:00 in the morning I get a text, "Don't forget to take your medicine. Check your sugar*." (I8, p. 4) • *She would say, "Well, how you feeling today, Natalya?" I was like "Well, today I'm not doing too good" or she say, "Well, how are your numbers coming?" and I say "Well, today my numbers is 127" and she say "Well, good, good, good." Well, then she'll call me a couple of days later and then she say "What's your numbers is today?" and so she just coach me through it, you know, giving me the hopes to getting my levels on the right track.* (I6, p. 2)
		2. Increased engagement in care processes	Increased follow-up with medical team and/or adherence	• *She would put me in touch with the right doctor you know and said, "Well you better come on up" you know, and I come up and see the doctor so she'll keep me on the path you know and stuff. So if I need a doctor for a particular reason she knew the direct doctor you know, so she was beginning and everything, you know. My beginning and my endings 'cause she would you know really 'cause before her I didn't come in regular. If I got sick I just got sick. I wouldn't come in, you know.* (I10, p.2) • *Well I think it [working with the CHW] gave me a little boost to where I wanted to do more and wanted to stay on track and you know made me feel positive you know and with taking my medications and stuff that helps me too to lose that depression and everything.* (I4, p. 10)
	B. CHW as an advocate	1. Connected patients to resources	Diabetes-related resources and non-diabetes related resources	• *She's probably said it once every couple months. She's been like, "If you need more resources, please use me and tell me what you need." She's always offered that olive branch.* (I7, p. 5) • *She, like I said at the time I was looking for an apartment and you know she, it's,*

		the apartment up the street they was taking application for low income you know because I'm retired right now so I needed low income apartments so she helped me with that. Right, she was told me they was taking applications, she even told me if I come in she'd help with you know go on the computer and 'cause I have no computer skills either. (I2, p. 2)
2. Works out problems in care processes	Communication with medical providers, pharmacists, and other professionals involved in the patient's care	• *When I was out of town – for the month I was out of town, I ran out of medication and the pharmacy for some reason wouldn't redo them, and I've been really bad about getting on MyChart. I apparently can't do it to save my life. And she talked to Dr. Lavelle directly and they got me the medication I needed.* (I7, p. 4) • *And another thing too that she helped, that she got straight, that I've been having years with getting, is my strips and me a meter to check my sugar 'cause over the years I wasn't able to check it because my insurance company wouldn't pay for one or the other. And the strips cost some money and I only get a set income. So she helped me with that, got the right meter for me and the right strips.* (I9, p. 1-2)
3. Assists with tasks	Scheduling appointments, finding non-medical information, etc.	• *Like I said she always call and ask me you know how is my sugars is doing, do I need to, and like I said if I need her to she would make me appointment so I thought that was pretty cool.* (I2, p.8) • *Well like I said I think she's a very good person to work with or to look into your business and stuff. If you have any questions about something if she don't know it she'll find somebody that does know it and it goes like that. She's really good at that.* (I4, p. 10)
4. Collaboration with care team	Attend medical appointments, take notes, remind patient to share information with their physician, bridge communication between the patient and	• *…she comes and sits with me because at first I had switched doctors two or three times and they gave me all this medicine. And I got kind of upset one day and she walked in and she said, "Come on, let's go sit in here and talk," and she got me straightened out about the medicine and you know what was wrong and Dr. Linden came in and they both sat down and talked to me because I was taking a lot of medicine. And Dr. Linden and Miss Octavia helped me get that straight to where I wasn't too terrified with too much medicine, taking too many pills.* (I8, p. 3) • *She got a hold of Dr. Lavelle and she communicated with Dr. Lavelle and she was able to tell things to Lavelle when I would forget them. She'd be like – Lavelle would be like "So Octavia told me this." I'd be like oops, I forgot that. [Laughs]. But she was always able to address things and she was, again, able to go those*

		physician	*extra miles when I needed that.* (I7, p. 4)
C. CHW as a teacher	1. Translation of medical/health information	Helping the patient to understand care regimens and their purposes, medications, etc.	• *Before her I knew I had diabetes but I didn't take my medicine the way I should. I was overeating. I was eating the wrong kind of food, you know, like red food for instance. I'm remember her saying red food's not good for you, maybe once a week or so. Certain types of food like starchy food. You know potatoes and all that. I would down those potatoes and steak and gravy and you know. So I've lost some weight, I done firm up a little bit. I have more energy, so I mean you know what can I say? You know she was everything, you know? She went above and her pay grade to help and everything was really nice.* (I10, p. 6) • *We have our meetings to where we meet up face-to-face, as well as the phone calls and that's more social for me. We just talk about our eating habits and we talk about how we can change our, my bad eating habit. So she shares a lot of information for me so that helps.* (I1, p. 3)
	2. Health progress	Improved health behaviors (e.g., diet, exercise), improved A1c/numbers	• *So since I been working with her, my A1c came down and everything because I started out where my A1c was at 11, but now it came down to an 8.* (I6, p. 1) • *When I was first diagnosed, my numbers were in the 500s on a regular basis and that's why I was – had all the symptoms of a diabetic. They're now in the 300s so they're not perfect but they – this morning it was 275 and it was exciting. [Laughs] But it's in more control than it was and that's because, again, I have those – I have social supports. I have check-ins.* (I7, p. 9)
D. CHW as a confidant	1. CHW as a major support person	Support from check-ins, talking, inspiring/motivating the patient	• *Because I know that as a senior citizen I have to come in often and get things checked out. I have to stay on my diet, I have to eat right food, I have to exercise you know and if I felt like I didn't want to exercise or anything, I could always talk to her and seeming like just talking to me would give me strength that I could go on, you know. Like if you're running a race and you get tired somebody you know over hollering at you, you know it make you want to go on so that would happen.* (I10, p. 4) • *I mean she was good, she was, you know, like I say I could talk to her about anything, you know, and you know she made me feel comfortable so I felt that I could share, you know, a part of, you know, my everyday life with her.* (I2, p. 5)
	2. Familiarity/ likeness	See the CHW as being like a "close	• *Oh man, I have to describe that. I don't know, I think she just very supportive. Like I say I feel comfortable with her 'cause I don't feel comfortable with anybody, I don't, you know, but I feel comfortable enough to share things with her*

			friend," "grandmother," "community member," etc.	*and I don't know, she just reminds me of an old friend, like you know that's my friend. And she gonna call me to you know, when she call me we just talk.* (I2, p. 6) • *It's been extremely helpful. It's been like talking with one of my peers, like talking with a grandma. She's really helpful. She checks in as needed. The first thing she asks every time is "How are you doing today?" as opposed to "What is your numbers at?" or "How's your diabetes?" Those questions always come second or third to emotional. And for me that's really important because sometimes I don't want to talk about my diabetes. I mean, I will once she's worked on me a little bit. [Laughs] And so I think that's an enormous way that she's helped and she's made it easier to talk about it is by not starting with the question of how's your diabetes?* (I7, p. 10-11)
2. Ecological Impact	A. Logistical support from family members	1. Support from family members also diagnosed with Type 2 diabetes	Reminders to take medications, follow a healthy diet, etc.	• *Yep. She tells me like I don't know, she makes sure I take my medicines though too. Then she'll call me and be like, "Oh my numbers was this." Then I'm like, "Okay, I'm going to call you and tell you mine." [Laughs] So yeah it's cool.* (I5, p. 10) • *Very helpful, but not overly. They know where to push and where not to push. They have similar challenges that I do when it comes to eating healthy and so that's comforting because I know that I'm not alone in my challenges, though I do like other vegetables that they don't so that's always a comfort. [Laughs]* (I7, p. 9)
		2. Support from younger generations	Involvement of younger generations in providing tangible support and care	• *My grandbaby is the most important thing. I've got 2 of them, 2 grandbabies, grandsons that are very supportive if ever I'm – even sometimes I can walk in the house where the other one is and he'll say, "You need to sit down because you don't look good. Did you take your sugar? You want some water?" and that's the way he is too. He's the same way. Those 2 are my heart and they help me go where I'm going and do what I need to do.* (I8, p. 8) • *So my daughter-in-law makes sure that – you know, she's like – she always asks me, "You take your medication?" And my son do too. Not as much 'cause he know sometime I tell him, "Nope, I didn't take it. I didn't feel like it." "Momma, you know."* (I9, p. 11)
	B. Diabetes as a part of a larger,	1. Biological factors	Factors impacting mood and diabetes self-	• *Well, she coach me through my diabetes. Well, some days I be so sick I can't get out of bed and then I had back surgery. And due to my back surgery, I have chronic pain and with the pain that I be experiencing it has me struggle getting in*

	more complex picture		care (e.g., fatigue)	*and out of bed. So she just coaching me along through the pain and help me continue having good – my blood sugar keeping it average*. (I6, p. 2) • *I'll get more tired. I think when things – when I know that my numbers are low, I'm feeling a lot more tired than usually. How it reacts … sometimes I'm a little more short-tempered but usually I'm just more lethargic.* (I7, p. 7)
		2. Psychological factors	Less interest in/motivation for diabetes self-care when mood is poor	• *Well, my mood made me – well, my mood didn't want me to control my diabetes at all because I was always depressed. I didn't want to eat. Sometime I overeat. It just put a big gap in my life and I didn't want to live. I was trying to really commit suicide with my life, didn't want to live. Octavia gave me hope. She really talked me out.* (I6, p. 5) • *I just, you know, personal things that going on in my life, it makes me, you know, it puts me in a mood so I don't, that's when I get off track with my diabetes 'cause I'm not thinking about, you know, my health, I'm thinking about, you know, the situation I mean at that moment.* (I2, p. 4)
		3. Social factors	Few friendships, not discussing diabetes with peers	• *Friends? I don't have too many friends. I don't associate with too many people. So it's only just my certain family members that I really be with. A lot of the friends that I had, it was in school. I don't see them. So a lot of 'em don't even know that I even have diabetes.* (I9, p. 11) • *Mm-mmm, I don't really tell people that I got it. I don't want people to look at me different and I don't know. People do, they think of the worst nowadays.* (I5, p. 10)
3. Auxiliary Findings	A. Social Isolation	---	Diabetes as an invisible illness; isolated socially	• *Well I really – my family is more my friends. I really don't have anybody outside of my family. You know it's mostly my family. I talk to my sister, something like that you know? I'm basically most to myself and the family.* (I4, p. 7) • *Well, me and my family don't really get along so I don't have no family up here. So that's why I said me and Octavia connected to well. Most of my family is back in Chicago so I don't have a great big family up here so I get lonely sometimes and bored.* (I6, p. 6)
	B. Poverty	---	Lack of resources to meet basic needs (e.g., finances,	• *… my husband and I have been considering getting a divorce because it'll drop my healthcare, how much I have to spend on healthcare significantly. 'Cause yeah I'm, you know, over $1,000.00 a month on premiums and prescriptions*. (I3, p. 3) • *I was seeing if I could help with the water bill, but there's no resources that help*

		food, insurance coverage)	*with that.* (I5, p. 2)
C. Significant Life Stresses	---	The presence of significant life stresses impacting diabetes self-care and overall wellbeing	• *Yeah, because your stress have a lot to do with your diabetes. You know your diabetes have a lot to do with your stress. So I would manage the stress.* (I10, p. 8) • *She got me – I mean regretfully it's not gonna show in my diabetic numbers because this year was really, really hard. I broke my ankle. We lost, my dad lost a friend. We lost a dog and then we lost a very close friend with Down's syndrome. I lost my summer job. [Laughs] And I lost my grandpa a month ago, and then we lost our other dog last week. So she caught me at a time when I really needed that support, which has been awesome. The weekly checks were really good. I feel bad because she wasn't able to help me as much as she probably could have because of all my life. Like I was out of work for two weeks and I couldn't cook my own meals for six weeks. I also moved back into my parents' house, so I didn't have much control.* (I7, p. 2)

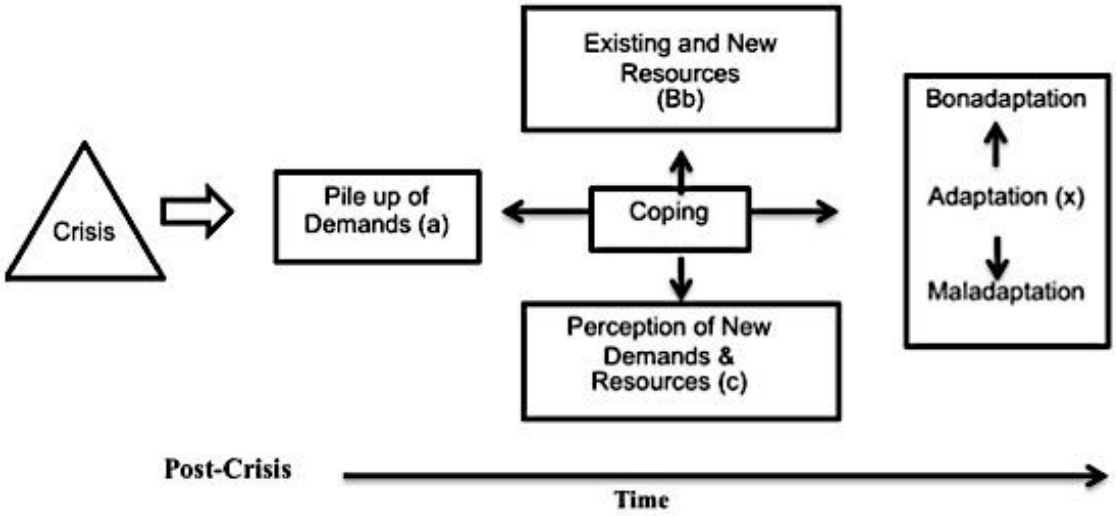

Figure i. Double ABC-X theoretical model of coping and adaptation post-crisis.
Note. This image is adapted from the theory illustrated in McCubbin & Patterson (1983).

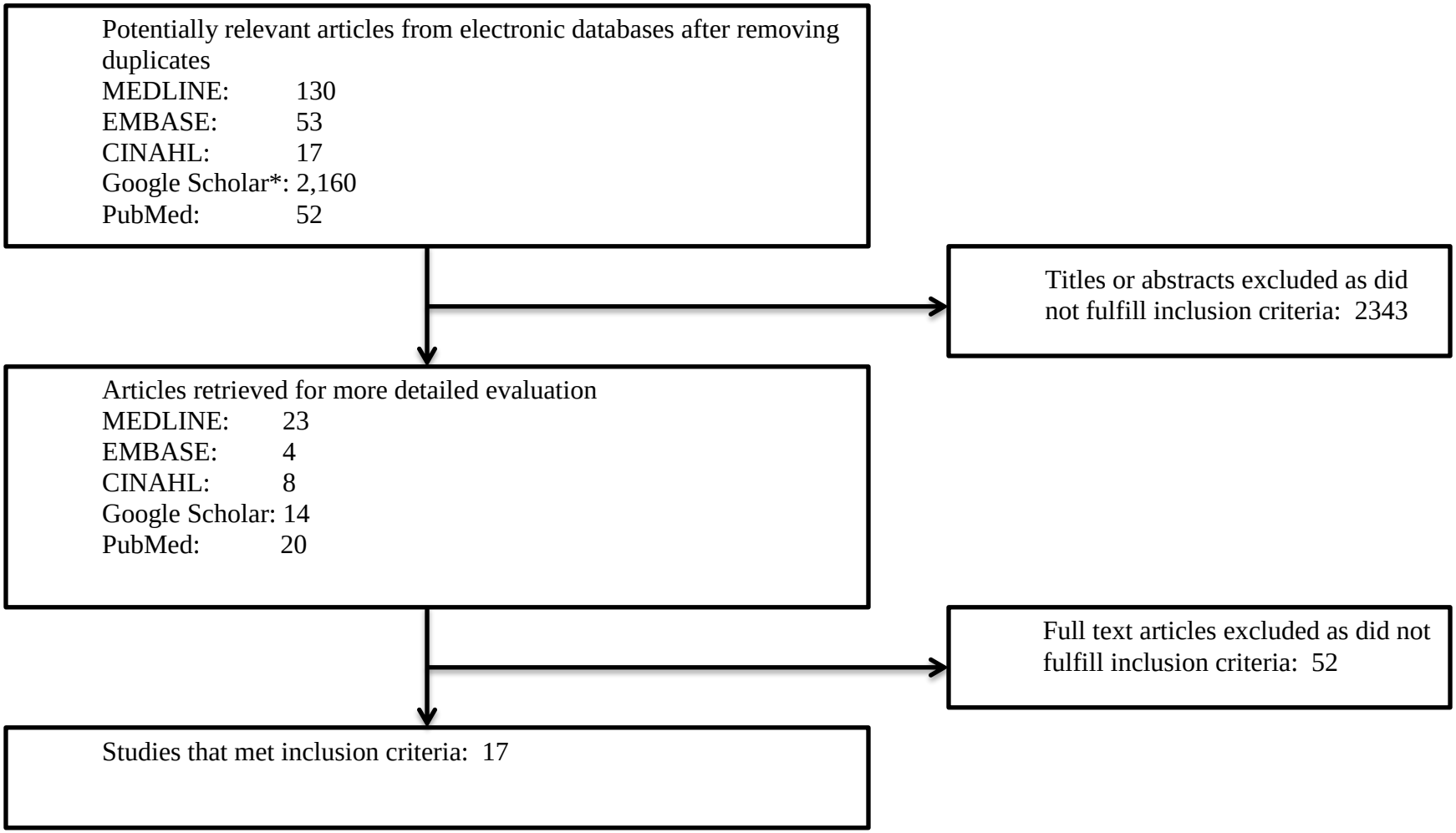

Figure 1a. Systematic review flow diagram.
Note. This database was not screened beyond the first 200 citations because no relevant citations were found beyond the first 150 citations.

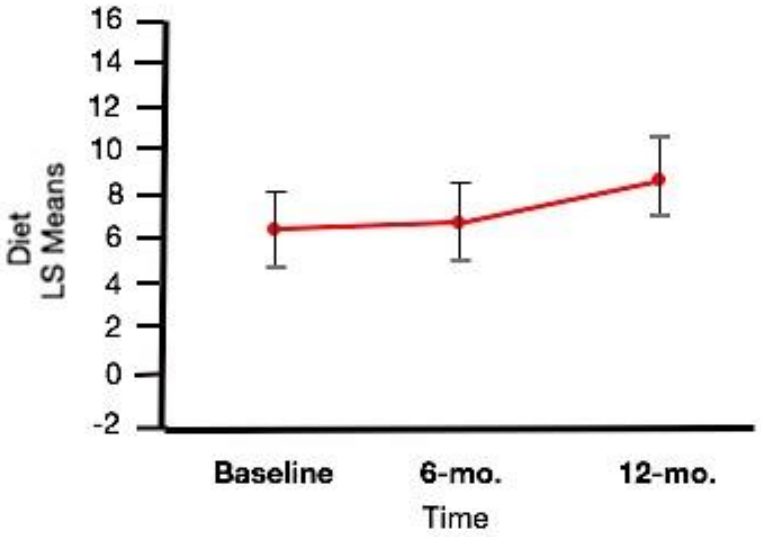

Figure 1b. Dietary adherence at baseline, six-months, and 12-months
Note. LS = Least Squares.

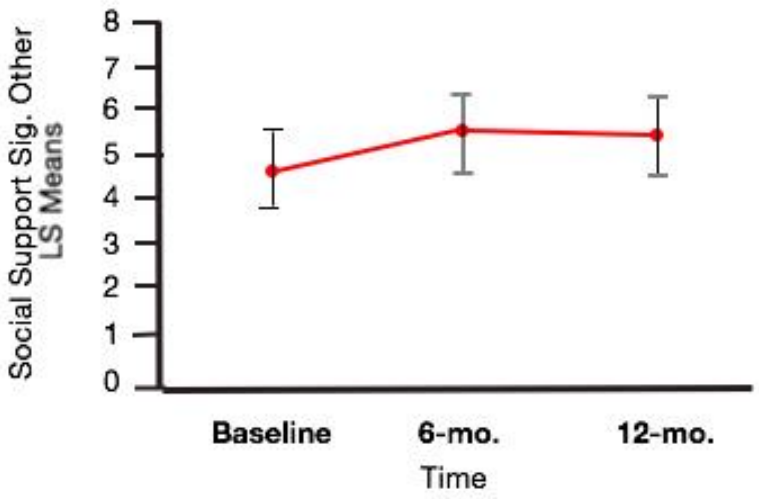

Figure 2b. Perceived social support from a significant other at baseline, six-months, and 12-months
Note. LS = Least Squares.

Appendix A

Consent Forms

Study Consent Form

You are invited to be in a research study of diabetes care at Broadway Family Medicine. You were selected as a possible participant because you are a patient at Broadway Family Medicine and have diabetes. Please read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Dr. Jason Ricco of Broadway Family Medicine Clinic and the University of Minnesota Department of Family Medicine and Community Health. It is funded by a grant from the UCare Foundation.

Background and Purpose:
The purpose of this study is to gain a better understanding of the experience of managing Type 2 diabetes. Your participation will provide valuable information regarding how we can better support our patients managing this complex diagnosis. We will be asking about your experience with social support, diabetes treatment adherence, mental health, and satisfaction with care.

Procedures:
This study will last about a year. If you agree to be in this study, we will ask you to do the following things:

- Complete a patient satisfaction survey at the beginning, mid-point, and end of the study.
- Continue to receive your usual care at Broadway Family Medicine Clinic.

We will collect some information from your medical record, such as lab values and hospitalizations.

Risks and Benefits of being in the Study:
The risks to participating in this study are small. First, in completing the survey, you may be asked personal or sensitive topics such as your mental health, social support, and access to resources. You can choose to not answer these questions at any time.

In addition, because we are collecting information about you, there is a small risk of breach of confidentiality. We will follow protocols to minimize this risk and keep your information private.

There may be no direct benefit to you from participating in this study. We hope that what we learn from this study will help us improve future diabetes care for our patients.

Costs and Compensation:
Your regular medical care will be billed in the usual manner.

Confidentiality:
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify you. Study data will be encrypted according to current University policy for protection of confidentiality. By law, the privilege of confidentiality does not extend to all data collected.

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Broadway Family Medicine Clinic or the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:
The researcher conducting this study is Dr. Jason Ricco. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at Broadway Family Medicine Clinic, 612-302-8200, or ricco004@umn.edu. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Statement of Consent:
I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Participant name
(printed):_____

Participant signature: _____ Date: _____

Name of person conducting consent
(printed):_____

Signature of Person Conducting Consent: _____Date: _____

Interview Consent Form

You are invited to participate in an interview about your experiences with the community health worker project at Broadway Family Medicine. You were selected as a possible participant because you are enrolled in a study to evaluate the impact of adding a community health worker to the Broadway healthcare team. Please read this form and ask any questions you have before agreeing to participate in this part of the study.

This study is being conducted by Dr. Jason Ricco of Broadway Family Medicine and the University of Minnesota Department of Family Medicine and Community Health.

Purpose: The purpose of this research is to learn about the health and healthcare experiences of Broadway patients who have been working with a community health worker. This information will help us evaluate how patients are impacted by the program and identify areas for improvement.

Procedures: If you agree to be in this study, we will ask you to participate in an interview about your experiences and thoughts related to your health, social support, and working with a community health worker. We will audio record the interview to make sure we don't miss any of your answers.

Confidentiality: Records of this study will be kept private. In any reports we might publish, we will not include any information that makes it possible to identify a participant. The interview recordings will only be used by the researchers and will be kept securely for up to two years.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota or with Broadway Family Medicine. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions: The researcher conducting this study is Dr. Jason Ricco. You may ask any questions you have now. If you have questions later, you are encouraged to contact him at ricco004@umn.edu or 612-302-8200.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researchers, you are encouraged to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Appendix B

Measures

Patient Health Questionnaire 9-item (PHQ-9)

The questions below ask you about several problems that you might have been bothered by over the past two weeks.

0 = Not at all
1 = Several days
2 = More than half the days
3 = Nearly every day

1.	Little interest or pleasure in doing things	**0**	**1**	**2**	**3**
2.	Feeling down, depressed or hopeless	**0**	**1**	**2**	**3**
3.	Trouble falling asleep, staying asleep or sleeping too much	**0**	**1**	**2**	**3**
4.	Feeling tired or having little energy	**0**	**1**	**2**	**3**
5.	Poor appetite or overeating	**0**	**1**	**2**	**3**
6.	Feeling bad about yourself – or that you're a failure or have let yourself or your family down	**0**	**1**	**2**	**3**
7.	Trouble concentrating on things, such as reading the newspaper or watching television	**0**	**1**	**2**	**3**

8.	Moving or speaking so slowly that other people couple have noticed. Or, the opposite – being so fidgety or restless that you have been moving around a lot more than usual	**0**	**1**	**2**	**3**
9.	Thoughts that you would be better off dead or of hurting yourself in some way	**0**	**1**	**2**	**3**

Generalized Anxiety Disorder 7-item (GAD-7)

1.	Feeling nervous, anxious, or on edge	**0**	**1**	**2**	**3**
2.	Not being able to stop or control worrying	**0**	**1**	**2**	**3**
3.	Worrying too much about different things	**0**	**1**	**2**	**3**
4.	Trouble relaxing	**0**	**1**	**2**	**3**
5.	Being so restless that it's hard to sit still	**0**	**1**	**2**	**3**
6.	Becoming easily annoyed or irritable	**0**	**1**	**2**	**3**
7.	Feeling afraid as if something awful might happen	**0**	**1**	**2**	**3**

Revised Summary of Diabetes Self-Care Activities Measure (SDSCA)

The following questions ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

1.	How many of the last SEVEN DAYS have you followed a healthful eating plan?	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.	On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

3.	On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking).	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4.	On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Multidimensional Scale of Perceived Social support (MDSS)

The following questions ask about the social support you receive from a significant other, family members, and friends.

1.	There is a special person who is around when I am in need.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.	There is a special person with whom I can share my joys and sorrows.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3.	My family really tries to help me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4.	I get the emotional help and support I need from my family.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5.	I have a special person who is a real source of comfort to me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6.	My friends really try to help me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7.	I can count on my friends when things go wrong.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8.	I can talk about my problems with my family.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9.	I have friends with whom I can share my joys and sorrows.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10.	There is a special person in my life who cares about my feelings.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

11.	My family is willing to help me make decisions.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12.	I can talk about my problems with my friends.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Appendix C

Interview Questions

1. Introduction of self and study

Purpose of study: The purpose of this research is to learn about the health and healthcare experiences of Broadway patients who have been working with a community health worker. This information will help us evaluate how the program impacts patients and identify areas for improvement.

Expectations for interview: If you agree to be in this study, we will ask you to participate in an interview about your experiences and thoughts related to your health, social support, and working with a community health worker. This will last about 45-60 minutes. We will audio record the interview to make sure we don't miss any of your answers.

2. Grand Tour Question: ***How would you describe your overall experience with working with the community health worker over the past several months?***
Follow-up questions:

- What do you think was most helpful about working with the CHW?
- What do you think was least helpful about working with the CHW?
- How did working with the CHW impact your experience of your care at Broadway Family Medicine, if it did at all?

3. Tour 1: Tell me about how working with the community health worker has impacted your ability to manage your diabetes.
Follow-up questions:

- In what ways do you think the CHW helped you to make progress toward achieving your health goals, including your diabetes goals?
- How would you describe any changes you might've felt in your sense of control of your health after working with the CHW?

4. Tour 2: How would you describe the ways that your diabetes continues to impact or affect your mood (if it does)?
Follow-up questions:

- Were or are there times when you felt your diagnosis impacted your mood more than other times? How so?
- What else?

5. Tour 3: Tell me about the social support you've received since being diagnosed with Type 2 diabetes.
Follow-up questions:

- How would you describe the social support you received from your family, friends, and/or partner?
- How would you describe the support you received from the community health worker?
- Who else? (e.g., church community, support group, etc.)

6. Conclusion and Thanks

Appendix D

Source of Knowledge

Epistemological Position and Qualitative Tradition

I conducted 10 key informant interviews guided by principles of postmodernism. Postmodernism, as compared to other epistemological positions, emphasizes multiple versions of reality and maintains that there is no singular or universal knowledge or truth. Rather, postmodernist researchers work to dismantle grand narratives and dominant discourses – which are defined as "normative" or "traditional" ways of thinking about reality – to make room for multiple voices and experiences (Zeeman, Poggenpoel, Myburgh, & Van der Linde, 2002). Postmodernism is largely about deconstructing taken-for-granted assumptions that are made about a phenomenon or population. Postmodernists focus on conducting a critical analysis of a phenomenon. Under this position, qualitative methods are implemented to discover each voice and the individual, subjective experience of each individual within the population of focus. In this research, assumptions and dominant discourses about the experience of managing Type 2 diabetes are dismantled to access multiple versions of reality within a group of patients who are experiencing that course and management of a chronic disease. Researchers grounding their study designs within postmodernism tend to focus interview questions toward gaining an understanding of each person's experience from his/her own unique and subjective point of view. Therefore, the postmodern approach is considered to be non-dogmatic and oriented to the details and uniqueness of everyday life for participants.

In addition to following a postmodern epistemological position, I utilized transcendental phenomenology to guide my research. Founded by Edmund Husserl,

phenomenology examines how people create descriptions of things by utilizing their senses, and how meaning is communicated about their lived experiences of a concept or phenomenon (Creswell, Hanson, Clark Plano, & Morales, 2007; Husserl, 1970; Moustakas, 1994). Said another way, phenomenology examines both *noema*, that which is experienced, and *noesis*, the way in which it is experienced (Moustakas, 1994). From this, the process of phenomenology includes a reduction of individual experiences with a phenomenon to understand meanings and essences. Transcendental phenomenology is one of two types of phenomenology that can guide the role of the researcher. Specifically, transcendental phenomenology is understood to focus less on the researcher's interpretation of the phenomenon and more on describing experiences of participants (Creswell, 2007; Moustakas, 1994). *Postmodernism posits that there are multiple truths that can exist alongside one another, whereas transcendental phenomenology focuses on rich descriptions that form common threads across these multiple truths in an effort to describe the essence of a phenomenon.*

I integrated a *standpoint epistemology* to situate the unique experiences of persons living with diabetes and bridge these two schools of thought. A standpoint epistemology focuses on the unique historically and socially situated experiences and realities of a particular population (in this case, socioeconomically disadvantaged minority patients managing Type 2 diabetes) to make meaning of their experiences from their point of view. From this perspective, while there are no ultimate truths, historical and social truths exist. Therefore, individual truths/experiences are represented while simultaneously discovering shared truths/themes across experiences of members of this population group. Within health care, discovering within-group similarities provides a conscious and

purposeful place to start (e.g., knowing that physical activity and exercise is important in controlling blood glucose levels), while still personalizing care based on unique factors/experiences (e.g., personalizing the ways that patients can be physically active and/or exercise by nature of their personal limitations, resources, neighborhood safety, and other factors).

Guided by the postmodern position and transcendental phenomenological approach, I analyzed data following Crabtree and Miller's (1999) thematic analysis method. Specifically, my thematic analysis approach was grounded in Moustakas' (1994) principles, but followed Crabtree and Miller's (1999) analysis guidelines. This method provided a narrative approach to access individuals' realities and understand participants' meanings and experiences. Specifically, I attempted to capture each participant's individual voice and subjective experience of working with a CHW, while at the same time uncovering commonalities shared by respective participants. This involved an iterative process of looking and describing to distill down to the categories, major themes, and subthemes across the group as a whole. As managing Type 2 diabetes is a complex and highly personal process that varies by individuals, accessing participants' individual experiences and meaning(s) provides a more in-depth understanding of the more global essence of managing this disease.

I utilized Crabtree and Miller's analytic approach because it attends to both individual truths (e.g., examining transcripts independently) and to connecting these truths together (e.g., clustering similar codes together to form categories, major themes, and subthemes). Recognizing that this population has some unique knowledge, this approach uses rich descriptions to access this knowledge. I also deemed it to be an

appropriate fit for this research due to the broader context of who will primarily be consuming this work. Specifically, within the context and culture of medicine, Crabtree and Miller's approach has been broadly used. It is a highly visible and respected method.

Self-of-the-Researcher

Research does not exist within a vacuum; it cannot be fully isolated and protected from bias. As a critical researcher, I must acknowledge and examine my own position, assumptions, and biases that I bring into my work. This involves a continuous process of self-reflection.

I selected to focus on the topic of diabetes for both personal and professional reasons. Personally, I have witnessed and walked alongside family members who have struggled to manage their Type 2 diabetes. I have seen how complex and wearing it can be to adhere to treatment regimens, such as making time for frequent medical appointments and getting regular exercise. Furthermore, I have seen how difficult it can be to talk about having this disease, even with loved ones. For example, one of my family members refuses to let his/her spouse attend medical appointments with him/her out of a desire to avoid receiving criticism about his/her diabetes management. Watching this within my own family has had a strong effect on me. Personally, I have felt at a loss for how to support and encourage my family member as well as frustrated by his/her unwillingness to allow our family to come alongside him/her. I am saddened by the drastic prevalence of this disease and how difficult it can be for so many people to manage it well. I also feel driven to fight against this disease by advancing research to uncover new ways to empower and support those who live with it.

Professionally, I am drawn to the topic of Type 2 diabetes because current standards of care do not function well as a one-size-fits-all approach; many people continue to struggle to adopt and/or adhere to their treatment regimens. Caring for patients can be hard on providers, too, because what works for one patient may not work for another. Several of the Family Medicine providers I work with have expressed feeling disheartened, frustrated, and confused when their patients have not been able to adhere to their treatment regimens, and feel limited by what they can do to support these patients. In my own clinical work, spending 30-60 minutes with a patient to "care" for his/her diabetes when diabetes management is truly a 24/7 process feels limiting. With these personal and professional experiences in mind, I believe that an alternative approach(es) to care that builds off of existing standard care practices and addresses common pitfalls is sorely needed.

One of the personal biases that I have been sensitive to is viewing myself as someone who is functioning in a "helper" or "rescuer" role. This can be both a blessing and a curse. On one hand, my natural inclination toward service leads me to step into opportunities to connect with others and work toward beneficent change. On the other hand, identifying as a rescuer might lead me to take on more responsibility in others' lives than what is necessary or appropriate. This unbalanced division of responsibility can be both detrimental for me and for the patients I work with, potentially enabling them to maintain (or even take on more) passive roles in their care. Further, I recognize that I am a young White privileged female coming into and serving a population that is predominantly Black, older, and lower in socioeconomic status. I have had to bracket and monitor these potential biases to limit their influence as I conducted the interviews and

analyzed the data. Specifically, I have documented personal and analytic memos to track these potential biases. I have also met with my advisor, Dr. Mendenhall, weekly to review my work and discuss my experiences throughout this process.

I have also been sensitive to my biases regarding how I view mental health providers, females, and students within the hierarchy of medicine. In my experience, being a young female mental health provider in-training has at times worked against and/or discredited my work, both with patients and with other providers. For example, sometimes my suggestions have been dismissed as naïve secondary to being a "beginner" in this work. This has felt frustrating and discouraging at times, yet has also energized me to continue to improve the work that I do and establish myself as a clinician and researcher. I also recognize that other patients still view me as being higher in the hierarchy and holding more power than them. This is something that I try to be mindful of and use strategies to create space for patients to share their perspectives. These biases, too, have the potential to influence my interactions with participants and with the data. I have attempted to recognize, monitor, and bracket my biases by memo-ing before, during, and after my thematic analysis, alongside having my efforts compared to the perspectives of two independent reviewers. I have also used member checking and documenting my process via an audit trail as ways to bracket my biases. I have shared my memos consistently with Dr. Mendenhall, and we have reviewed and discussed my experiences at-length and throughout this process.

Appendix E

Coding Manual

Major Theme	Category	Subcategory	Code	Description	Example Quotations
1. CHW Roles	A. CHW as a coach	1. Regular reminders/ check-ins	Coach-Remind	Telephone calls, text messages, check-in's while at the clinic	• *I told you she calls me every – she texts me every day and asks how I'm doing. She asks how much – how I feel and then she asks me how much was my sugar today, did I take it, did I take my medication, and right there that's the helping part. She reminds me sometimes. I get into my feelings and I forget about taking medication and she – at 7:00 in the morning I get a text, "Don't forget to take your medicine. Check your sugar*." (I8, p. 4) • *Coaching, her coaching me, calling me with the reminder calls, seeing how I was doing periodically with me being in and out of the hospital stays and still calling me, giving me the courage to check in on me*. (I6, p. 1)
		2. Increased engagement in care processes	Coach-Engage	Increased follow-up with medical team and/or adherence	• *She would put me in touch with the right doctor you know and said, "Well you better come on up" you know, and I come up and see the doctor so she'll keep me on the path you know and stuff. So if I need a doctor for a particular reason she knew the direct doctor you know, so she was beginning and everything,*

				you know. My beginning and my endings 'cause she would you know really 'cause before her I didn't come in regular. If I got sick I just got sick. I wouldn't come in, you know. (I10, p.2) • *Well I think it [working with the CHW]gave me a little boost to where I wanted to do more and wanted to stay on track and you know made me feel positive you know and with taking my medications and stuff that helps me too to lose that depression and everything.* (I4, p. 10)
B. CHW as an advocate	1. Connected patients to resources	Advocate-Resources	Diabetes-related resources and non-diabetes related resources	• *Well, she did a lot for me. She helped me get my cane. She helped me get the necessities that I needed to get on in my daily life like my shower bench. She made things possible for me to live in everyday life that I have struggled* (I6, p. 2) • *She, like I said at the time I was looking for an apartment and you know she, it's, the apartment up the street they was taking application for low income you know because I'm retired right now so I needed low income apartments so she helped me with that. Right, she was told me they was taking applications, she even told me if I come in she'd help with you know go on the computer and 'cause I have no computer skills either.* (I2, p. 2)

	2. Works-out problems in care processes	Advocate-Problems	Communications with medical providers, pharmacists, and other professionals involved in the patient's care	• *When I was out of town – for the month I was out of town, I ran out of medication and the pharmacy for some reason wouldn't redo them, and I've been really bad about getting on MyChart. I apparently can't do it to save my life. And she talked to Dr. Lavelle directly and they got me the medication I needed.* (I7, p. 4) • *And another thing too that she helped, that she got straight, that I've been having years with getting, is my strips and me a meter to check my sugar 'cause over the years I wasn't able to check it because my insurance company wouldn't pay for one or the other. And the strips cost some money and I only get a set income. So she helped me with that, got the right meter for me and the right strips.* (I9, p. 1-2)
	3. Assists with care-related tasks	Advocate-Tasks	Scheduling appointments, finding non-medical information, etc.	• *And then like when, I know that the doctor told me to come back in two weeks and then she called me then and that reminds me because I don't know why I walk past that desk, I walk past that desk, I don't make the two-weeks appointment. I always I'm gonna go home and I'm gonna do it but when I, she calls me then I realize, oh man you need to make appointment to go. And you know, I mean sometimes she would make the appointment for me.* (I2, p.1)

				• *Well like I said I think she's a very good person to work with or to look into your business and stuff. If you have any questions about something if she don't know it she'll find somebody that does know it and it goes like that. She's really good at that.* (I4, p. 10)
	4. Collaboration with care team	Advocate-Collaborate	Attend medical appointments, take notes, remind patient to share information with their physician, bridge communication between the patient and care team	• *She comes and sits with me because at first I had switched doctors two or three times and they gave me all this medicine. And I got kind of upset one day and she walked in and she said, "Come on, let's go sit in here and talk," and she got me straightened out about the medicine and you know what was wrong and Dr. Linden came in and they both sat down and talked to me because I was taking a lot of medicine. And Dr. Linden and Miss Octavia helped me get that straight to where I wasn't too terrified with too much medicine, taking too many pills.* (I8, p. 3) • *She got a hold of Dr. Lavelle and she communicated with Dr. Lavelle and she was able to tell things to Lavelle when I would forget them. She'd be like – Lavelle would be like "So Octavia told me this." I'd be like oops, I forgot that. [Laughs]. But she was always able to address things and she was, again, able to go those extra miles when I needed that.* (I7, p. 4)

	C. CHW as a teacher	1. Translation of medical/health information	Teacher-Information	Helping the patient to understand care regimens and their purposes, medications, etc.	• *Before her I knew I had diabetes but I didn't take my medicine the way I should. I was overeating. I was eating the wrong kind of food, you know, like red food for instance. I'm remember her saying red food's not good for you, maybe once a week or so. Certain types of food like starchy food. You know potatoes and all that. I would down those potatoes and steak and gravy and you know. So I've lost some weight, I done firm up a little bit. I have more energy, so I mean you know what can I say? You know she was everything, you know? She went above and her pay grade to help and everything was really nice.* (I10, p. 6) • *We have our meetings to where we meet up face-to-face, as well as the phone calls and that's more social for me. We just talk about our eating habits and we talk about how we can change our, my bad eating habit. So she shares a lot of information for me so that helps.* (I1, p. 3)
		2. Health progress	Teacher-Progress	Improved health behaviors (e.g., diet, exercise), improved A1c/numbers	• *So since I been working with her, my A1c came down and everything because I started out where my A1c was at 11, but now it came down to an 8.* (I6, p. 1) • *When I was first diagnosed, my numbers were in the 500s on a regular basis and that's why I was –*

				had all the symptoms of a diabetic. They're now in the 300s so they're not perfect but they – this morning it was 275 and it was exciting. [Laughs] But it's in more control than it was and that's because, again, I have those – I have social supports. I have check-ins. (I7, p. 9)
D. CHW as a confidant	1. Functioning as a major support person	Confidant-Support	Support from check-ins, talking, inspiring/ motivating the patient	• *Because I know that as a senior citizen I have to come in often and get things checked out. I have to stay on my diet, I have to eat right food, I have to exercise you know and if I felt like I didn't want to exercise or anything, I could always talk to her and seeming like just talking to me would give me strength that I could go on, you know. Like if you're running a race and you get tired somebody you know over hollering at you, you know it make you want to go on so that would happen.* (I10, p. 4) • *I mean she was good, she was, you know, like I say I could talk to her about anything, you know, and you know she made me feel comfortable so I felt that I could share, you know, a part of, you know, my everyday life with her.* (I2, p. 5)
	2. Familiarity/ likeness	Confidant-Familiar	See the CHW as being like a "close friend," "grandmother," "community	• *Oh man, I have to describe that. I don't know, I think she just very supportive. Like I say I feel comfortable with her 'cause I don't feel comfortable with anybody, I*

				member," etc.	*don't, you know, but I feel comfortable enough to share things with her and I don't know, she just reminds me of an old friend, like you know that's my friend. And she gonna call me to you know, when she call me we just talk.* (I2, p. 6) • *It's been extremely helpful. It's been like talking with one of my peers, like talking with a grandma. She's really helpful. She checks in as needed. The first thing she asks every time is "How are you doing today?" as opposed to "What is your numbers at?" or "How's your diabetes?" Those questions always come second or third to emotional. And for me that's really important because sometimes I don't want to talk about my diabetes. I mean, I will once she's worked on me a little bit. [Laughs] And so I think that's an enormous way that she's helped and she's made it easier to talk about it is by not starting with the question of how's your diabetes?* (I7, p. 10-11)
2. Ecological Impacts	A. Logistical support from family members	1. Support from family members also diagnosed with Type 2 diabetes	Family-T2D	Reminders to take medications, follow a healthy diet, etc.	• *Yep. She tells me like I don't know, she makes sure I take my medicines though too. Then she'll call me and be like, "Oh my numbers was this." Then I'm like, "Okay, I'm going to call you and tell you mine." [Laughs] So yeah it's cool.* (I5, p. 10) • *Very helpful, but not overly. They know where to push and where not to*

				push. They have similar challenges that I do when it comes to eating healthy and so that's comforting because I know that I'm not alone in my challenges, though I do like other vegetables that they don't so that's always a comfort. [Laughs] (I7, p. 9)
	2. Support from younger generations	Family-Younger	Involvement of younger generations in providing tangible and emotional support and care	• *My grandbaby is the most important thing. I've got 2 of them, 2 grandbabies, grandsons that are very supportive if ever I'm – even sometimes I can walk in the house where the other one is and he'll say, "You need to sit down because you don't look good. Did you take your sugar? You want some water?" and that's the way he is too. He's the same way. Those 2 are my heart and they help me go where I'm going and do what I need to do.* (I8, p. 8) • *So my daughter-in-law makes sure that – you know, she's like – she always asks me, "You take your medication?" And my son do too. Not as much 'cause he know sometime I tell him, "Nope, I didn't take it. I didn't feel like it." "Momma, you know."* (I9, p. 11)
B. Diabetes as a part of a larger, more complex picture	1. Biological factors	Complex-Bio	Factors impacting mood and diabetes self-care (e.g., fatigue)	• *Well, she coach me through my diabetes. Well, some days I be so sick I can't get out of bed and then I had back surgery. And due to my back surgery, I have chronic pain and with the pain that I be experiencing it has*

				me struggle getting in and out of bed. So she just coaching me along through the pain and help me continue having good – my blood sugar keeping it average. (I6, p. 2) • *I'll get more tired. I think when things – when I know that my numbers are low, I'm feeling a lot more tired than usually. How it reacts … sometimes I'm a little more short-tempered but usually I'm just more lethargic.* (I7, p. 7)
	2. Psychological factors	Complex-psycho	Less interest in/motivation for diabetes self-care when mood is poor	• *Well, my mood made me – well, my mood didn't want me to control my diabetes at all because I was always depressed. I didn't want to eat. Sometime I overeat. It just put a big gap in my life and I didn't want to live. I was trying to really commit suicide with my life, didn't want to live. Octavia gave me hope. She really talked me out.* (I6, p. 5) • *I just, you know, personal things that going on in my life, it makes me, you know, it puts me in a mood so I don't, that's when I get off track with my diabetes 'cause I'm not thinking about, you know, my health, I'm thinking about, you know, the situation I mean at that moment.* (I2, p. 4)
	3. Social factors	Complex-social	Few friendships, not discussing diabetes	• *Friends? I don't have too many friends. I don't associate with too*

				with peers	*many people. So it's only just my certain family members that I really be with. A lot of the friends that I had, it was in school. I don't see them. So a lot of 'em don't even know that I even have diabetes.* (I9, p. 11) • *Mm-mmm, I don't really tell people that I got it. I don't want people to look at me different and I don't know. People do, they think of the worst nowadays.* (I5, p. 10)
3. Auxiliary Findings	A. Social isolation	---	Other-Isolated	Diabetes as an invisible illness; isolated socially	• *Well I really – my family is more my friends. I really don't have anybody outside of my family. You know it's mostly my family. I talk to my sister, something like that you know? I'm basically most to myself and the family.* (I4, p. 7) • *Well, me and my family don't really get along so I don't have no family up here. So that's why I said me and Octavia connected to well. Most of my family is back in Chicago so I don't have a great big family up here so I get lonely sometimes and bored.* (I6, p. 6)
	B. Poverty	---	Other-Poverty	Lack of resources to meet basic needs (e.g., finances, food, insurance coverage)	• *My husband and I have been considering getting a divorce because it'll drop my healthcare, how much I have to spend on healthcare significantly. 'Cause yeah I'm, you know, over $1,000.00 a month on premiums and prescriptions*. (I3, p. 3)

				• *I was seeing if I could help with the water bill, but there's no resources that help with that.* (I5, p. 2)
C. Significant Life Stresses	---	Other-Stress	The presence of significant life stresses impacting diabetes self-care and overall well-being	• *Yeah, because your stress have a lot to do with your diabetes. You know your diabetes have a lot to do with your stress. So I would manage the stress.* (I10, p. 8) • *She got me – I mean regretfully it's not gonna show in my diabetic numbers because this year was really, really hard. I broke my ankle. We lost, my dad lost a friend. We lost a dog and then we lost a very close friend with Down's syndrome. I lost my summer job. [Laughs] And I lost my grandpa a month ago, and then we lost our other dog last week. So she caught me at a time when I really needed that support, which has been awesome. The weekly checks were really good. I feel bad because she wasn't able to help me as much as she probably could have because of all my life. Like I was out of work for two weeks and I couldn't cook my own meals for six weeks. I also moved back into my parents' house, so I didn't have much control.* (I7, p. 2)

Appendix F

Audit Trail

1. Preparation for analysis
    A. On 12/7/16, I created two outlines to review and compare Phenomenology/ Moustakas with Deductive Content Analysis. I also reviewed Morrow's (2005) Quality and Trustworthiness in Qualitative Research in Counseling Psychology.
    B. Meeting notes from meeting with Tai on 12/9/16
        A. Methodology and Analysis Approach – Discussed rationale for deductive content analysis vs. phenomenological analysis. Agreed that a thematic analysis that falls between these two analyses and is guided by theory, but allows for new understandings to be revealed, is ideal. I will look at articles published in *Qualitative Health Research* that parallel this project and present this to Tai and my committee.
        B. Trustworthiness Categories – Tai and I reviewed trustworthiness and refined categories as "Subjectivity & Reflexivity", "Dependability", "Data Adequacy", "Interpretation Adequacy" and "Data Triangulation". Discussed data triangulation between quantitative and qualitative data as increasing validity of both data sources.
        C. Conducting Interviews – Tai and I discussed preparations for conducting interviews, including having multiple recording devices and practicing delivery of interview questions.
    C. Meeting notes from meeting with Tai and Liz on 12/16/16
        A. Presented rationale for considering a change to my analysis approach
        B. Discussed articles reviewed in *Qualitative Health Research* and Braun & Clark's (2006; 2014) Thematic Analysis approach
        C. Method vs. Analysis – Discussed difference between methodology (broadly conceptualized) and analysis (generic vs. pure), balance between inductive and deductive, identifying steps in three levels of analysis, emphasis on the four criteria for trustworthiness, and creating a thorough audit trail
        D. It was agreed that I will keep Phenomenology as my methodology and will work with Tai to decide my analysis approach (Braun & Clark vs. Moustakas vs. Crabtree & Miller)
    D. On 12/20/16 I created an outline providing an overview and analysis steps to compare Braun & Clark vs. Moustakas vs. Crabtree & Miller
    E. Meeting notes from meeting with Tai on 12/22/16
        A. Analysis Approach – Reviewed outline and Tai and I agreed to follow Crabtree & Miller's analysis approach. The primary reason for deciding to follow this approach is because it is a well-regarded / highly-utilized / broadly-accepted approach in healthcare research; this also / thereby positions it as a better fit for the journal *Families, Systems & Health*.
        B. Supplemental document – We discussed creating a supplemental document to be sent to my committee with my dissertation articles that

outlines how the two articles fit together and how conclusions/implications from my research fit within the larger body of literature. We will confirm that this will meet departmental expectations/standards.

F. *Personal memos:*
    A. *I recognize that I may be biased in several respects, which have the potential to influence how I conduct interviews/interact with participants and how I analyze the data. Specifically, I may be biased as a result of being a Caucasian, young, privileged female working with a population that is primarily African American, older, and lower SES/not privileged. I will have to be careful of and bracket my helper/rescuer biases, as well as any biases I might have around diabetes, weight, and so on.*
    B. *I may also have biases as a result of how I view a mental health provider within the hierarchy of medicine, as well as how I view my being a student and/or a female within this hierarchy. This is something I will have to monitor.*

2. Analysis
    A. Read through all transcripts without taking notes
        A. On 12/28/16, I read through transcripts 1-5
        B. On 12/30/16, I read through transcripts 6-9
        C. On 1/4/17, I read through transcript 10
    B. Read all interviews noting major themes that emerged as significant. Also replaced all identifying information and tracked replacements in a key that is stored securely.
        A. ID 1 – read on 1/2/17
            1. Patient thought the weekly phone calls were most helpful for her and gave her helpful reminders for diabetes self-care behaviors. Patient said her work with the CHW influenced her decision to continue to receive care at the clinic. Patient noted behavior change in checking her numbers. CHW gave patient information on different resources. Patient is unsure of the potential link between mood and diabetes. Patient said she does not share everything with the CHW because she has other people she gets support from.
        B. ID 2 – read on 1/2/17
            1. Phone call check-ins and reminders for doing daily diabetes self-care behaviors were very helpful for the patient. CHW gave patient resources for non-diabetes related concerns. Patient feels more in control because monitoring diabetes more closely. Patient noted personal things impact mood and make caring for his/her diabetes more difficult at times. Talking with the CHW was helpful; like an "old friend."
        C. ID 3 – read on 1/2/17
            1. The patient expressed feeling guilty when she did not meet the CHW's expectations; "like your teacher, mom, and nun." Helpful to not feel alone in having diabetes. Home visits with the family

were helpful. Introduced to new/alternative options and resources. Change in patient's awareness. Mood as a response to hormone changes more than diabetes, but related. Family involvement by monitoring food/drink intake and criticism.

D. ID 4 – read on 1/2/17
    1. The CHW was helpful with issues with insurance coverage (repeated story x3) and connecting patient to other resources. CHW went out of her way to help patient. Team medical visits were helpful for the patient. CHW helped the patient resume daily diabetes self-care behaviors after falling off. Difficulty with caring for sick husband and with depression symptoms. CHW's personality was a primary influence on the patient. Family provides support through checking on patient's eating habits and medication adherence. Family provides encouragement.
E. ID 5 – read on 1/2/17
    1. CHW provides information and resources beyond just information on diabetes. If the CHW doesn't have the answer, she will find the answer. The CHW reminds the patient to check her meter because the CHW will ask. Positive impact on medication adherence. Primary support is parent with diabetes. Family and peers can get overinvolved.
F. ID 6 – read on 1/3/17
    1. Patient found coaching from the CHW to be most helpful and got courage from her. CHW provided diabetes-related and non-diabetes related information and resources to meet patient's needs. The CHW program was beneficial for the patient's family as a whole. Impactful on A1c and symptoms of depression. CHW gave the patient hope.
G. ID 7 – read on 1/3/17
    1. The CHW-doctor-patient connections were helpful for the patient to manage diabetes self-care behaviors. Other stressful life events made managing diabetes difficult emotionally. Family support and involvement, particularly from those with diabetes, was very helpful. CHW went the extra mile to help the patient. CHW would "cluck tongue" when the patient was not adherent. Lowered mood impacted patient's motivation to adhere to diabetes treatment plan.
H. ID 8 – read on 1/3/17
    1. CHW's caring, helpful personality and reliability were very important to the patient. CHW was like a good friend. CHW worked closely with patient's doctor to help the patient understand the diabetes treatment plan. Patient said having diabetes is difficult emotionally, and that it changes a person. Support from CHW and from family members were particularly important. CHW gave patient instructions, which was helpful.
I. ID 9 – read on 1/3/17

1. CHW explained reasoning for the patient's diabetes treatment plan. The CHW helped overcome barriers to getting correct medication dose and meter. The patient gets motivation and monitoring from family members. CHW also focused on other health concerns, such as high blood pressure, and reminded patient to keep stress down.

J. ID 10 – read on 1/5/17
    1. The CHW discussed spirituality with the patient, which was helpful. The CHW helped the patient identify goals to work toward and checked in on progress regularly to keep patient on track. CHW would 'holler' at patient, which was experienced as being helpful for motivating patient. Patient expressed concern about going back to previous behaviors when work with the CHW ends. Patient gained knowledge about diet and other self-care behaviors. Patient linked stress to diabetes. Family involvement includes monitoring medication adherence. Patient said losing CHW is like losing a real family member.

K. Summary of potential major themes and subthemes. Themes were viewed as major if they were present in at least 50% of the interviews.
    1. The CHW's daily reminders and check-ins are both positive and negative (feeling guilty when not doing well)
    2. Family support is much more common than support from friends, peers, or others in the community, particularly if family members also have diabetes
    3. Provision of resources that meet basic needs as well as diabetes-related resources
    4. CHW experienced as someone close to the patient (close friend, grandma, therapist, etc.)
    5. Importance of the CHW's personality and being relatable
    6. CHW as link between patient and medical team

C. Memos:
    A. *Personal memo: I hope to hear that patients' diabetes self-care behaviors changed, and that they saw their work with the CHW as valuable. I need to be conscious of my bias toward interpreting responses as describing a positive change, and to give attention to other less-positive experiences or instances where change did not occur.*
    B. *Analytic memo: I included several reflection statements and potentially leading questions. I will consult with Tai about not including data that might be too leading and therefore less trustworthy to be coded alone (i.e., without additional context).*

D. On 1/4/17, read all transcripts again and organized responses by interview question in excel document in preparation for meeting with Tai.
E. Meeting notes from meeting with Tai on 1/5/17:
    A. Independent Reviewer – involving a peer as an independent reviewer to help avoid biases, articulate ideas, and increase trustworthiness. I

contacted Jaime Ballard and she agreed to be an independent reviewer after I identify my themes and subthemes.

B. Member checking – after reviewing the transcripts several more times, create a 1-page document that summarizes findings from each participant's interview and invite all participants to add and correct any information. I will review my IRB document to see if I included anything about member checking and will contact Jeffrey Perkey at the IRB to see if a change of protocol is needed. Due to the population being highly mobile and highly vulnerable, phone calls might be the best approach (as opposed to sending a letter) to protect confidentiality and reach participants.

F. Emailed Jeffrey Perkey and Ellen Dodds on 1/12/17

A. Email sent to Jeffrey Perkey (University of Minnesota IRB faculty) on 1/12/17 to inquire about if a change of protocol is needed for member checking:

> "I am a doctoral candidate in the Family Social Science department and am working with my advisor, Tai Mendenhall, to complete my dissertation research (IRB Study #1512S81042, PI is Dr. Jason Ricco). I am wondering if you can advise me as to whether a change of protocol is required for contacting patients via telephone for member checking. Specifically, I would contact each participant that completed an interview, provide a verbal summary of their own responses to the interview questions, and offer an opportunity for them to correct any information that does not accurately reflect their experiences and/or to add additional information. Please let me know if you think this would be considered exempt or would require an application for a change of protocol."

Response from Jeffrey Perkey (University of Minnesota IRB faculty) on 1/12/17 regarding my question. Mr. Perkey's response is as follows:

> "No, I don't think a change in protocol is necessary since the contact entails follow-up on already collected data. A change would need to be submitted if you had a new research question or were collecting new/different data."

B. Email sent to Ellen Dodds (project coordinator for the study) on 1/12/17 to inquire about if Tai and Jaime Ballard need to be added on as additional personnel on our IRB for conducting data analysis using deidentified data.

> "I am wondering if we need to add Tai and one other person who is acting as an independent reviewer for data analysis (this increases trustworthiness of the thematic analysis) as additional personnel on

> our IRB. They will only have access to deidentified data. Do you think that this needs to go through IRB?"

Response from Ellen Dodds (project coordinator for the study) on 1/12/17 regarding my question. Ms. Dodds' response is as follows:

> "We will not need to add Tai to the IRB if he's just dealing with the de-identified transcripts. I double checked w/ my supervisor."

G. Notes from meeting with Tai on 1/12/17 with personal memos in italics.
    i. Overall experience re: CHW
        1. Having someone in their corner
            a. Accessibility
            b. Translation of medical information
            c. Coach
            d. Safe/easy to talk with (about diabetes and other stressors)
            e. Not much was unhelpful
                i. *Analytic memo: Is this due to social desirability? Because she did an exceptional job? As an effort to try to keep her long-term at the clinic?*
    ii. Impact of care experience
        1. Reminders/check-ins as a part of care
            a. Improved knowledge
            b. Increased engagement (with care visits/processes)
            c. Increased perception of support and encouragement
        2. Resources mostly for non-diabetic related concerns
            a. *Analytic memo: I think about Maslow's hierarchy of needs with this population. Would this be different in another population?*
        3. CHW's personality
            a. Importance of the personal connection
                i. *Analytic memo: Did the CHW's kind/sweet personality impact how her reminders/check-ins were received?*
                ii. *Analytic memo: Consistency in patient interactions through empathic engagement and good communication skills. CHWs being socially equipped seems like it could be more important/influential than being knowledgeable about diabetes care*
                    1. *This is complicated because then the "fit" of an individual for a CHW position would be a very biased process dependent on his/her personality. I will have to explore*

this further and be careful in how I discuss this.

iii. Impact on diabetes management
    1. Health progress
        a. Increased frequency/consistency of checking blood sugar
        b. Improved health behaviors (diet, exercise)
        c. More consistent engagement in self-care practices
    2. Increased sense of control/agency
        a. Improved diet, self-care, overall understanding of care processes

iv. Impact on mood
    1. Diabetes as a part of a larger more complex picture
        a. Mixed findings on relationship between mood and diabetes
            i. *Analytic memo: Because of the complexities of patients' lives, diabetes care may fall off the radar*

v. Social support
    1. Logistical support from other family members with diabetes
        a. *Analytic memo: This may reflect families being more oriented toward survival in a physical sense over an emotional sense. This somewhat fits with the literature on extended family networks/fictive kin*
        b. *Analytic memo: Is the provision of support from younger generations (e.g., kids, grandkids) important here? Is this because of availability or because it is better tolerated because it feels less threatening?*
    2. CHW as major support person
        a. CHW positioned in a close support role (e.g., like a "close friend," "therapist," "grandmother")
        b. Support via check-ins, calls, information, talking/cheering on
            i. *Analytic memo: This seems to contradict Stack's (1975) thesis that, especially within the African American community, there are strong kinship networks (aka. "fictive kin" or "extended family networks" that are socially constructed). From this thesis, we would expect that patients' primary support, source of knowledge about resources, and so on would already be in place and come from their extended family network. An initial theme from these interviews is suggesting that the CHW filled this role for patients.*

1. *Is this indicative of a movement toward more Western sense of community/way of living? Does this point to the fact that the experience of having diabetes is very isolating and disconnects people from the interwoven-ness of the African American community? Something else?*

3. Other support from physician and faith community

vi. Fear of ending work with the CHW

1. Concern about continuing management of diabetes self-care
2. Concern about losing connection and support

H. On Thursday 1/19/17 and Friday 1/20/17, I re-read through all of the transcripts and created a coding matrix of initial themes. Specifically, I coded all participants' responses by the potential themes identified in my meeting with Tai on 1/12/17. I made note of all excerpts that could be dual-coded and any excerpts that were not coded.

I. I met with Tai on 1/20/17 to discuss coding matrix of initial themes. We compared reflections and identified four primary themes: 1) The CHW as a coach; 2) The CHW as an advocate; 3) The CHW as a teacher; 4) The CHW as a confidant. I will reorganize my coding matrix by these four primary themes. I will also go back through the excerpts that were not coded to see how they might fit into these four themes.

J. On 1/27/17 and 1/28/17, I read back through the first three interviews and coded by the initial themes decided upon in my meeting with Tai on 1/20/17. I created a document of coding questions to track all passages that I did not code and/or are not sure of the code to discuss in my next meeting with Tai on 2/2/17

A. *Analytic memo: I coded tangible>emotional support from support system, support from younger generation, and not sharing about diabetes with peers/family as subthemes under the CHW as confidant theme. However, as I am reading through interviews and coding these excerpts, these quotes do not directly point to the CHW as a confidant. I am wondering if these need to be separated out as an additional theme or not.*

K. On 1/31/17 and 2/1/17, I read through the remaining seven interviews, coded them by the initial themes, and added un-coded passages to my coding questions document. I then created four documents and separated out the excerpts by theme (i.e., coach, advocate, teacher, confidant). I updated my major themes and subthemes as follows:

1. CHW as a coach
    a. Regular reminders/check-ins
    b. Improved knowledge
    c. Increased engagement in care processes
2. CHW as an advocate
    a. Connected patients to resources

b. Works out problems in care processes
c. Assists with tasks

3. CHW as a teacher
    a. Translation of medical information
    b. Health progress
        i. Increased frequency/consistency of checking blood glucose
        ii. Improved health behaviors (diet, exercise)
        iii. More consistent engagement in self-care practices
        iv. Improved A1c/numbers
4. CHW as a confidant
    a. CHW as a major support person (tangible and emotional)
        i. Support from check-ins, sharing information, talking
        ii. Concern about losing connection and support after intervention
    b. Familiarity/likeness of CHW
    c. CHW's personality
5. Family/Peer Involvement
    a. More tangible support than emotional support
    b. Support from family members with T2D
    c. Support from younger generations
6. Diabetes as part of a larger, more complex picture
    a. Mediating and moderating factors (e.g., fatigue, life stressors)
    b. Less interest in/motivation for diabetes self-care when mood is poor
7. Other themes/subthemes not already organized:
    a. Support from doctors, churches, etc.
    b. Not much was unhelpful
    c. Desire to avoid getting into trouble/disappointing CHW/made to feel guilty
    d. Concern about continuing to manage self-care after intervention
    e. CHW interactions with PCP (e.g., taking notes, giving information)

L. Notes from meeting with Tai on 2/2/17
    A. I will rename "CHW interactions with PCP" as "CHW as collaborator with care team" and include as a subtheme under the CHW as an advocate theme
    B. In the next stage of thematic analysis, I will consider separating out health progress outcomes from the CHW as a teacher theme and either including it as its own theme to present at the end or interspersing a discussion of health outcomes as a result of patients' work with the CHW throughout

C. I will also go back through my coding questions with the new themes and subthemes to identify what excerpts will be coded as "other", any potential patterns that could develop into a new theme or subtheme, and questions to review with Tai.

M. On 2/9/17 and 2/14/17, I read through all interviews and confirmed or adjusted the coding based on the revised themes and subthemes developed with Tai on 2/2/17. I also flagged all "other" codes in the transcripts and compiled them in a document to review with Tai on 2/17/17.
   A. *Analytic memos:*
      1. *I'm wondering if I should add a theme/subtheme of increased confidence/motivation. Several people discussed the CHW as providing "inspiration." Could this be a part of why she was experienced as a major support person (an existing subtheme)?*
      2. *The theme "Family/Peer Involvement" is not very descriptive. I am wondering if it would make sense to move the subtheme "Logistical support from family members" to the main theme, which would make sense with the remaining subthemes of "Support from family members also diagnosed with diabetes" and "Support from younger generations."*
      3. *There are several subthemes that involve improving/gaining knowledge. I think I need to remove the coach subtheme "improved knowledge" and distinguish the CHW as a Teacher subtheme "Translation of medical information" from the CHW as an Advocate subtheme "Finding (non-medical) information."*
      4. *Should the CHW as a Confidant subtheme "the CHW's personality" be a stand alone subtheme or tied in primarily with the subtheme "Familiarity/Likeness"? I think the CHW's personality was an important factor in how she was experienced as a confidant, but I also believe her personality was a large factor in patients' experience of the other two subthemes.*
      5. *I think I should remove the subtheme "Concern about losing connection and support" from CHW as a Confidant because it did not get coded frequently enough to warrant a subtheme.*
      6. *In the "other" codes, not sharing about diabetes with friends/peers came up several times across multiple interviews. I believe this should be included as a subtheme, but will discuss with Tai where it would fit best.*

N. Notes from meeting with Tai on 2/17/17:
   A. The theme *Diabetes as a Part of a Larger, More Complex Picture* will connect with the biopsychosocial model of health and illness (also connecting to my theoretical conceptualization). The subthemes will be divided by biological factors (e.g., fatigue), psychological factors (e.g.,

low mood) and social factors (e.g., not talking about diabetes with friends), all connecting to Type 2 diabetes management

B. The "other category" will be briefly presented in my results section as "other things that came up that are clinically important to pay attention to." These include, but are not limited to, social isolation ("the invisible illness"), life stressors, and living in poverty. I may discuss Maslow's hierarchy of needs in this section.

C. Tai and I discussed at length my question about keeping or removing "the CHW's personality" as a subtheme. On one hand, from the interview data it was that the CHW's personality was extremely influential in patients' experiences of this program, their health progress, and their overall wellbeing. On the other hand, we are both concerned about keeping it as a subtheme for two main reasons. First, the readers may have a negative reaction to highlighting the CHW's personality if they do not identify themselves as having similar traits or if they perceive this to be biased hiring. Second, it may threaten the credibility of the findings of this research by introducing the question, "Would the rest of this hold up if the CHW were to be a different person?" From our discussion, we decided to merge "the CHW's personality" subtheme with the other two subthemes, primarily the "Familiarity/likeness" subtheme as appropriate.

D. We discussed the saturation effect in conducting Crabtree and Miller's thematic analysis. I will send Tai an updated version of my themes and subthemes incorporating the changes made today and Tai will review all of the interviews once more to check for saturation. I will also have Jaime Ballard independently review three of my transcripts to check for accuracy.

O. On 2/17/17 I emailed Jaime Ballard two transcripts at random and my themes and subthemes to conduct an independent analysis.

P. Response from Jaime Ballard sent on 2/19/17 along with the two transcripts that she coded:

"I took a three-step approach to reviewing the transcripts.

1. Read through all transcripts. Identified broad categories that I would use as blanket codes, if I were starting from scratch.

- Experiences with providers (Octavia, Doctor) (Subthemes identified with Octavia: There for me, easy to talk to, checks in, gives information, gets information straight/takes notes, reminds me, is consistent, connects me to resources, shows concern, gets me necessities, gives hope, is sweet, brings to reality, diabetes outcome change, coaching)
- Experiences with family
- Experiences with other social support
- Impact of diabetes on mood
- Impact of mood on diabetes

2. Code two transcripts using these codes, identify any needed changes.

I chose each comment as the unit of analysis and gave each a primary code. I occasionally assigned a secondary code if it seemed like there were two important, separate codes.

3. Check my codes against Thematic Analysis.

It looks like my codes fit in with your themes and subthemes.

- Experiences with providers: Reminds me, Coaching - Coach
- Experiences with providers: Connects me to resources. gets me necessities - Advocate
- Experiences with providers: Gives information, gets information straight, Diabetes outcome change - Teacher
- Experiences with providers: easy to talk to, checks in, is consistent, shows concern, gives hope, brings reality, is sweet - Confidant
- Experiences with family - Logistical support from family members, social isolation

- Experiences with other social support - social isolation
- Impact of diabetes on mood - Diabetes as part of a larger, more complex picture
- Impact of mood on diabetes - Diabetes as part of a larger, more complex picture"

A. Jaime's independent review is very consistent with my coding and supports the major themes and subthemes I have identified. Minor discrepancies included:
    1. Jaime coded a subtheme of "gets information straight" under the major theme of *Teacher.* I coded these data as either collaboration with the care team under the major theme *CHW as Advocate* or as translation of medical/health information under the major theme *CHW as Teacher*
    2. Jaime coded social isolation under the major theme of *Experiences with Family* as well as a separate major theme *Experiences with Other Social Supports*. I coded social isolation as a part of the subtheme social factors under the major theme *Diabetes as a Part of a Larger, More Complex Issue*

Q. On 2/14/17 I sent my audit trail to Liz Wieling for her review and feedback. On 2/22/17 I sent my audit trail to Jerica Berge for her review and feedback. Feedback from Jerica is as follows:
   A. In meeting notes from 12/20/16, discuss why you decided to go with Crabtree & Miller for the thematic analysis
   B. In meeting notes from 12/20/16, clarify if the supplemental document was agreed upon or just discussed
   C. In first stage of analysis, clarify what were considered major themes vs. Subthemes and how it was determined what was considered a major theme

D. In meeting notes from 1/5/17, clarify if all or a portion of the participants will be contacted for member checking
E. In Jaime Ballard's independent review summary, comment on how her review compares

R. On 2/23/17 and 2/24/17 I began to identify quotes that illustrate the themes and subthemes to include in my coding manual
S. In preparation for my meeting with Tai on 2/24/17
    A. I need to be mindful of the 3500 word limit for my second article. I am considering presenting the majority of the quotes in a table format and only including a few strong quotes in the actual text. Another option would be to include this as an appendix; however, quotes will also be included in my coding manual, so this may be repetitive.
    B. Discussing process of member checking – how do I document participants' responses, and how do I incorporate their responses into my analysis?
T. Notes from 2/24/27 meeting with Tai
    A. We discussed organizing audit trail files (e.g., coded transcripts at different stages) in a google doc and making note of the different stages in my audit trail
    B. We decided to add approximately 2 quotes for each theme/subtheme in my coding manual
    C. I will draft summaries of each individual interview for conducting member checking. I will send ~3-4 of these documents to Tai for review. After receiving his feedback, I will conduct member checking via the telephone and will document their responses.
    D. We discussed the format of the two-article dissertation and what appendices/supplemental documents are required. I will review my cohort's student handbook (2013) and will send this to Tai. Tai will also contact Cathy Solheim to consult with her about departmental expectations for this format.
U. On 2/26/17 I drafted the member checking summaries and sent the first three documents to Tai. I received his feedback on 2/27 and made his suggested changes. His primary feedback was to make it sound less "academic" and more conversational. He also recommended I pause mid-way through summarizing the main points taken from their interviews to check if I've gotten things right so far and not just wait until the end to confirm this.
    A. *Personal Memo: In doing member checking, I think it will be particularly important for me to monitor my personal biases and how they might impact these conversations. It will be particularly important to monitor my biases around my position of power in the hierarchy of medicine, and also my perception of being a "rescuer." I certainly would not want to unintentionally communicate to patients that "we've got it all figured out now" and minimize what this experience has been to them or how*

difficult managing their diabetes might have been. To monitor this, I've had Tai review my summaries and will use these to guide conversations.

V. On 2/26/17 I received Tai's coded transcripts for his independent review.
   A. There were no significant discrepancies found in Tai's coding compared to my final coding.

W. On 2/28/17 Cathy Solheim replied to Tai and said the following:

> "For the dissertations I've directed with two articles, there was an introduction that set the stage for the two studies (perhaps that's what you're referring to in the two pages) including the gap in the literature the studies address and their significance. It also included an overview of study 1 and study 2. Then it's the two papers. A final discussion section connects the dots between the two articles and sets them back into the literature and how they contribute to the gaps that were established and reinforces the significance outlined in the introduction. So in essence, the two articles have bookends - one is a stage-setter and the other is the wrap around/integration of the two studies. And yes, in the appendices are the extensive supporting documents such as you've outlined. I think the only thing I've offered different than what you wrote is the introduction that sets the stage and launches the two articles. I'm also thinking that it could include the guiding theoretical foundation if perhaps the same one(s) was/were used - usually not a lot of room for an expanded theory section in articles."

X. Notes from meeting with Tai on 3/2/17
   A. In consultation with Cathy, Tai and I decided to follow her recommendation to include a global introduction and conclusion section to "book-end" my two articles. The introduction section will set the stage for the two articles and the gap in the literature that the studies address. The conclusion section will discuss how the studies inform the larger body of literature. I will no longer include this information as a supplemental document to my committee.
   B. In drafting my appendix on epistemology and self-of-the-researcher, I will also include a discussion of my potential biases prior to conducting the qualitative analysis. I will draft this appendix, send it to Tai for review, and then request that Liz review it as the qualitative expert on my committee.

Y. On 3/3/17 I finished drafting the qualitative results section and my epistemology and self-of-the-researcher appendix and sent them to Tai for review.

Z. On 3/6/17 I contacted all participants who were interviewed for member checking. Their responses were documented. There were no discrepancies between the information participants added and the major themes and subthemes identified.

AA. On 3/7/17 I drafted the global introduction section and sent it to Tai for review.

BB. On 3/8/17 I began conducting my quantitative analyses. From the linear mixed modeling, two models were significant (dietary adherence and perceived social support from a special person)

A. *Analytic memo: Could it be that participants were so socially isolated that weekly check-ins with the CHW drastically changed their perception of their social support within the first six months? Did this plateau at 12 months because it was not as significant of a difference (I.e., they became used to it) or because they were preparing to lose the support from the CHW? Could it be that their work with the CHW activated their social support network or their perception of their social support network outside of the CHW?*
B. *Personal memo: I am surprised that participants did not report significant change at 6-months and post-intervention in their PHQ-9 and GAD-7 total scores. I would've thought that having the CHW as a support and confidant would have impacted their experience of emotional distress. However, I recognize that these symptoms are not solely a result of social isolation. Patients described a multitude of concerns, such as lack of resources to meet basic needs, that are likely to have a significant impact on participants' moods, even with the additional support.*

CC. Notes from meeting with Tai on 3/9/17:
A. Discussed member checking responses and presentation. Participants' responses will be presented in red font in the Member Checking supplemental electronic file.
B. We discussed my timeline. I will have a prepared draft of my full dissertation to him by 3/25/17 and will submit my dissertation to my committee no later than 4/25/17.
C. We discussed the statistically significant models (diet adherence, perceived social support from a special person). I will look at the survey responses for who the special person was that they were thinking of when responding to these questions. This could help to bridge the quantitative and qualitative findings regarding the role of the CHW as a confidant.
D. We discussed feedback from reviewers for the revise and resubmit for article 1.

DD. On 3/10/17 I edited article 1 and created a new table presenting intervention results.

EE. On 3/14/17 I finalized the quantitative analyses

FF. On 3/15/17 I drafted the quantitative results section and submitted my revised article 1 for publication

GG. On 3/16/17 I edited the epistemology and self-of-the-researcher sections of my appendix and drafted the trustworthiness section

HH. Notes from meeting with Tai on 3/16/17
A. We discussed how postmodernism, phenomenology, and my analytic method fit together and reviewed a portion of my draft
B. We discussed my concerns around including A1c in my quantitative analysis. Specifically, my concern about the 21 cases in which A1c was documented in the medical system as "A1c > 14" instead of a specific

value, as well as the 11 control participants with only one A1c documented. Tai recommended I email Jerica Berge to get a second perspective from someone familiar with research in medical settings. I will also look into if an exact A1c value can be identified.

1. Jerica's response: "1. I would definitely not use the same A1c value pre- and post-. For the A1c analysis you could just say you conducted the analysis in a sub-sample that had complete data...as long as your experiment and control group have close to the same number of participants. 2. If you choose #1, I would then assign all A1c values >14 a 14, or categorize the A1c variable into meaningful categories such as 1-<7, 7-14, and >14. I realize this could change your analysis because it won't be a continuous variable anymore. 3. Or, you could just drop the A1c analysis altogether. I would prefer you just doing a sub-analysis on the sample that has complete A1c data. Re: keeping A1c continuous or categorical, you can decide. Although I would try to keep in mind what would be more convincing to reviewers when you try and publish this."

C. We discussed my next steps for finishing drafting my dissertation

II. On 3/17/17 I drafted my Article 2 discussion, implications and conclusion sections and abstract and my global abstract and conclusion, completing a full draft of my dissertation.

JJ. Notes from meeting with Tai on 3/23/17

A. Update on A1c analysis – No clinical values are available as the lab equipment in the clinic does not report A1c values above 14. These data were not sent to the hospital for additional testing. We discussed the drawbacks of excluding these cases as well as imputing a number (e.g., 14.5 or 15) for all ">14" cases. Tai will email a colleague in the Family Medicine department to consult about this issue. I will talk with the project PI to learn how these data were handled in the matched control process.

B. We continued our discussion regarding how postmodernism, phenomenology, and my analytic method fit together.

KK. The project PI said that A1c values of ">14" were replaced with 14.4 and treated as a number. 14.4 was picked because there are a few A1c values that are bigger than 14 but weren't entered as ">14", and 14.4 was in the middle of them. In consultation with Tai and Jerica, I decided to include an analysis of A1c. I will remain consistent in handling the ">14" values as "14.4" and will remove cases with only one A1c time point.

LL. Notes from meeting with Tai on 3/30/17

A. We reviewed Tai's feedback on my first full draft

B. Ready to send Epistemological position section of Appendix to Liz for review

C. I will add more detailed information regarding the matched controls

MM. Notes from meeting with Tai on 4/13/17

A. Reviewed the feedback from Liz on my epistemological position subsection of my Source of Knowledge appendix. I emailed Liz on 4/12/17 to schedule a meeting to discuss this further.

B. Discussed strategies for dealing with space constraints in article 2. I will revise my dissertation based on Tai and Liz's feedback and will send it to Tai within 5 days.

NN. On 4/18/17, I spoke with Liz to discuss her feedback on my Source of Knowledge appendix. Her feedback was incorporated into this section. I also incorporated Tai's feedback received on 4/17/17. The next step is to finalize my dissertation manuscript in preparation for sending it to my committee.

OO. On 4/20/17, I met with Tai to finalize my dissertation and sent my dissertation documents to my committee.

PP. On 5/15/17- 5/17/17, I made the recommended revisions outlined by my committee and drafted a cover letter outlining these changes.